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FLIGHT

AIRCRAFT, SPACECRAFT, MISSILES

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Airline Captains' Pay

RECENT letters from readers have confirmed what the general secretary of the British Air Line Pilots Association has described as "the anomalous position which exists in connection with airline captains' pay." It is distressing to find that the latest of these letters—in a tone of professional banter—has in some quarters been taken seriously. It is timely, therefore, to remark that though a captain's remuneration may vary with his employer—corporation or independent—any suggestion that professional standards are allowed to be compromised by differences in pay is, of course, entirely false. Nor do the standards of today's independent operators invite any such criticism, and there cannot be any suggestion that British airline captains, whether corporation or independent, are given to comporting themselves in a manner alien to their calling and responsibilities.

Pooling and the Public

MONTH by month the list of world airlines operating in pool grows lengthier. The past two years, in fact, have seen the negotiation of a phenomenal number of agreements, and only one great nation of air commerce—the USA—continues to repudiate the practice of pooling. American anti-trust laws, framed to protect the consumer's interest, would quickly haul into court any US airline that shared its earnings with another, whether domestic or foreign.

The Minister of Aviation has told Parliament that a pool is a "commercial matter" and that its terms therefore cannot be disclosed. It might be doubted whether Mr Sandys knows the terms himself. The former deputy managing director of BOAC, when interviewed on this subject two months ago (*Flight*, April 29, page 609) said that the details of BOAC's pool agreements with the UK independents were not necessarily known to the Minister, and that it was unlikely that he would call for details. "If I tell you that I have washed behind my ears," Mr Granville added good-humouredly, "you don't have a look to make sure, do you?"

Agreed. But what are we to make of Lord Casey's little revelation in the House of Lords the other day? He disclosed that a section of the BOAC/Air-India/Qantas tripartite pool "contains a stipulation by Air-India and by Qantas to the effect that they will regard the agreement between them as valid only so long as BOAC remains the only United Kingdom airline authorized [on the routes concerned]."

Closer ties with Commonwealth airlines are of course to be warmly welcomed, and it *may* be right that the British independents should be excluded from the eastern hemisphere. We know that the Minister endorses Commonwealth pools; but might it not now be asked whether he endorses the right of Commonwealth airlines possibly to clip the wings of Britain's independents?

Pool agreements do not infringe the Restrictive Trade Practices Act, 1956, which applies only (Section 6) to the supply of goods and not to services; and they are protected by Section 2 of the Civil Aviation (Licensing) Act, 1960, which protects any "commercial agreement reasonably entered into" by any existing licence holder. But it will be disappointing if our new Licensing Board is frustrated by operators who feel that they have only to wave a secret pool agreement at the Board to ensure that their operations will be protected. So extensive now is pooling that this sort of thing could lead to stagnation as sterile as the old so-called associate agreements.

FROM ALL QUARTERS

BOAC's Whole-time Chairman

AS this page goes to press the long-awaited new BOAC appointments are announced by Duncan Sandys, Minister of Aviation. As anticipated, Sir Matthew Slattery is appointed whole-time chairman, succeeding (on July 29) Sir Gerard d'Erlanger, part-time chairman since May 1956. Sir Matthew has been chairman of Short Brothers & Harland Ltd; he was until recently chairman of Bristol Aircraft. His part-time deputy is to be Sir Wilfred Neden, the industrial relations expert, who joined BOAC's board in 1958.

Three new part-time directors are appointed also: J. A. Connel, vice-chairman of Unilever and a director of BOAC Associated Companies since 1957; Lionel Poole, until last year general secretary of the National Union of Boot and Shoe Operatives; and Sir Walter Worboys, chairman of British Tyre and Rubber Industries and a director of Westminster Bank.

Further details will appear next week.

New Gliding Champions

WINNERS of the 1960 World Gliding Championships, which ended at Butzweiler Airfield, Cologne, last Saturday, were Rolf Hossinger of Argentina in the Open Class, and Heinz Huth of West Germany in the Standard Class. Hossinger was flying a Slingsby Skylark 3, and Huth a Ka-6BR.

Nicholas Goodhart of Britain (Olympia 419) came fourth in the Open Class, with the Polish pilots Makula and Popiel (Zefir 2) second and third. Fifth was Sven Jonsson of Sweden in a Zugvogel 4. In the Standard Class Huth was followed by Münch (Ka-6B), Brazil; Witek (Foka), Poland; Sejstrup (Ka-6BR), Denmark; and Juez (Ka-6), Spain. *Flight*'s day-by-day report on the championships (pages 861-863) will conclude in next week's issue.

Continental Tynes

SINCE the British Government declined to admit that at some future date the RAF may have to acquire the Breguet 1150 Atlantic maritime reconnaissance aircraft, the NATO countries which have adopted it are handling virtually all the manufacturing work involved. The Rolls-Royce Tyne 20 turboprop is to be produced under a licence which is expected to be signed next month between the Derby company and SEM Hispano-Suiza, who will manufacture most of the engine at Bois-Colombes. Substantial portions are likely to be farmed out to the well-known Belgian FN company. Both firms have much experience of building Rolls-Royce engines.

The number of engines involved, for the Br.1150 and the Franco-German Transall C.160 transport is put at "more than 500." Rolls-Royce will receive royalties on each one produced.

Belvedere to Idris

INDICATIVE of the potentialities of the large helicopter was the remarkable flight made last week by an RAF Westland (Bristol) Belvedere to Idris in North Africa for tropical trials. Officially observed times and speeds for two stages are being submitted by the RAeC for FAI confirmation and, if accepted, will rank as the first helicopter point-to-point records.

Provisional figures for these two stages, including stops, were: London - Rome, 8hr 13min for 850 n.m.; and London-Luqa (Malta), 12hr 6min for 1,220 n.m. Provisional average speeds were: London - Rome, 103kt (118 m.p.h.) and London - Malta 100kt (115 m.p.h.). Overall average speed, excluding stops, was 113kt (130 m.p.h.).

RECORD-SEEKERS: The crew of the Westland (Bristol) Belvedere which made a notable flight to North Africa last week (news-item, col 1). Left to right: Flt Lt G. W. Smith, Wg Cdr C. B. Brown (captain) and M/Eng A. E. Risby

The Belvedere—better known, perhaps, as the Bristol 192, powered by two Napier Gazelle NGa.2s—was one undergoing Service clearance trials at the A and AEE. Its captain was Wg Cdr C. B. Brown, CO of "D" Sqn at Boscombe Down, and the co-pilot was Flt Lt G. W. Smith; M/Eng A. E. Risby was flight engineer.

The helicopter took off from Gatwick at 0334hr GMT on June 14 and flew non-stop to the French Air Force base at Orange/Caritat in Southern France, a distance of 475 n.m. covered in 4hr 10min. After a 33min fuelling stop it went on to Pratica di Mare, Rome, 3hr 30min for 375 n.m. Here there was a 41min fuel stop before continuing to Luqa, 3hr 12min. At Luqa, which was reached at 1540hr GMT, the Belvedere night-stopped before completing the final stage to Idris.

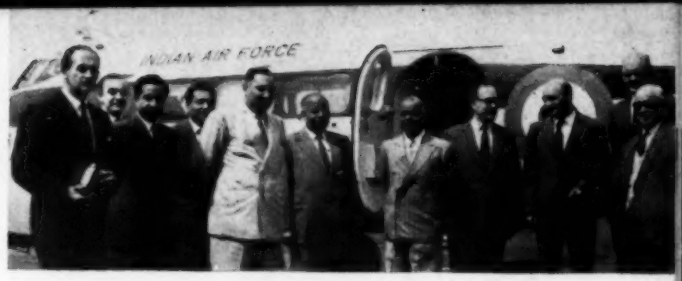
SSB Radio for the V-force

NEWSPAPER reports last week that £20m worth of airborne SSB radio was to be ordered from Collins (either the British or the American company) for RAF aircraft is, apparently, an optimistic estimate which Collins themselves are regretfully obliged to deny. What does exist is an order with the US Collins Radio Co for single-sideband airborne radios to equip seven AW.660 Argosies for the RAF. The original figure of £20m was based on the estimated cost of a Collins SSB radio, multiplied by the estimated number of aircraft in RAF Bomber, Coastal and Transport Commands, all factored for spares provision.

In view of the recent decision to co-ordinate more closely the operation of V-force and Strategic Air Command bombers, a move to equip the British aircraft with SSB radio appears logical. SAC aircraft have been using Collins equipment for some years, but

CUSHIONED: Hovering well clear of the grass at Bembridge Airport, Isle of Wight, is the Britten-Norman Cushioncraft on one of its initial "tethered" tests. A detailed description and cut-away drawing of this vehicle, which is to be used experimentally by Elders & Fyffes for banana transport in the Cameroons, appears in this issue. The power unit, driving a peripheral rotor, is a 170 h.p. Coventry Climax

MINISTER IN CONTROL: George Ward, MP, Secretary of State for Air, recently flew the Handley Page Herald, taking off and landing at Radlett. With him is Capt R. Shilton, the Silver City pilot, who took the aircraft on its recent South American tour; and next to Gp Capt G. P. Harger, station commander at Northolt (where the Herald picked up Mr Ward) is E. Manley Walker, H.P. (Reading) director and manager



TO SEE THE AVRO 748 at Woodford last week came visitors from India, where the type is to be manufactured for the Indian Air Force as a Dakota replacement. In this group are, left to right:—

E. Galitzine, Avro sales manager; D. W. R. Andrew, sales superintendent; Sqn Ldr Bhandari; Wg Cdr Chopra; AVM Nanda, Deputy Chief of Air Staff; S. Jayasankar, Financial Adviser, Ministry of Defence; O. Pulla Reddi, Defence Secretary; S. G. Joy, Avro director and general manager; Gp Capt Moolgavkar, Air Adviser to the High Commissioner in London; J. R. Ewans, Avro director and chief designer; and C. E. Fielding, production director

equivalent British equipment is already under development for BOAC airliners and military/civil standardization offers considerable attractions. Incidentally, Britain pioneered the original application of SSB. Its main advantages are the provision of more channels in the crowded HF band by reduction of the frequency spectrum used by each channel and the ability to derive much greater transmitted power and longer range by channelling the power of the transmitter into one side-band.

If Collins equipment were bought in bulk for the RAF it would be manufactured in Britain by the newly formed L.C.E. Ltd, a joint venture by Collins and Joseph Lucas (Industries) Ltd.

The Rotodyne's Future

FOR many weeks there has been an undercurrent of rumour to the effect that the Westland group are anxious to promote their own Westminster helicopter at the expense of the Rotodyne VTOL airliner, responsibility for which passed to them when the group purchased most of the former Fairey Aviation Ltd. This contention is very far from the truth.

The present position is that the group are maintaining the design and project teams at Hayes and White Waltham at maximum effort, and are additionally conducting widespread technical investigations into all aspects of the Rotodyne programme. The company's view is that, like Hawker Siddeley, they have swallowed a huge meal during the past few months and must be given time to digest it. Financially the Rotodyne programme is virtually assured, the Minister of Aviation having allocated £4m to the manufacturer for its development and having promised a further £1.4m to BEA to assist its introduction to commercial service.

In fact, far from allowing the Rotodyne to die, Westland are very conscious of the magnitude of the task facing them on this aircraft, and of the fact that it has been widely "sold" to the world at large at a relatively early stage. Their own Westminster poses much fewer and smaller development problems—the critical transmission, rotor and control systems are essentially fully proven S-56 parts—but nobody at Yeovil regards it as being a VTOL airliner in the Rotodyne class but merely a big, and very good, helicopter.

More About the Brantly

FURTHER information is now available on the performance of the Brantly B-2 helicopter, references to which have appeared in two recent issues of *Flight*. Amending to some extent the figures quoted last week, normal engine operating range for all flight conditions is 2,800-2,900 r.p.m., and within this band there are no restrictions. There is a placarded restriction for continuous operation at between 2,400 and 2,600 r.p.m., but as this is a range only passed through during accelerating and decelerating the engine to and from its normal speed is not a real limitation from the operational point of view. It is impossible to over-pitch the rotor, and 2,900 r.p.m. can be obtained with the collective-pitch control on its up-stop. Normal cruise is obtained at 55 per cent power, and this gives 90-95 m.p.h. and a fuel consumption of 7 Imp gal/hr at gross weight. There are no operational restrictions other than the normal flight-envelope limitations such as V_{NE} speeds and engine temperatures.

The British company, Brantly Helicopters Ltd, of 131 Ystrad Road, Fforestfach, Swansea, state that current US production of B-2s is two per week; that the first commercial user achieved over 93 hours' utilization in the first three weeks of operation; that operating costs have worked out at just over $18 (£6 10s) an hour on a 300hr/yr utilization (with cost written off in four years, but not including pilots' pay); and that the price f.a.f. Frederick, Okla, is $19,950 (£7,125), giving a duty-paid price of about £8,771 in this country.

Croydon: Something Missing

THE town of Croydon is currently celebrating 1,000 years of recorded history with two main events, a millenary exhibition and a millenary pageant. The exhibition site is in the Airport grounds, and the familiar Hangars C and D, in the north-east corner, have taken on a transitory lease of life as "Halls of Commerce and Industry," with a fun fair and other attractions outside.

On so historic a site the visitor might reasonably expect to find an honoured place for aviation. Certainly, Croydon's world fame as an airport is recalled, mainly in an exhibition of actual aircraft. These transpire to be a selection (nine aircraft, three cars, one Hucks starter) from the beautifully kept Shuttleworth Collection. These machines are always worth examination, whether statically

SEVENTH CENTURY: Last week R. P. Beamont, English Electric's manager of flight operations and chief test pilot, made his 700th Lightning flight. Here he is seen before take-off, with ground-crew foreman L. Dean appropriately proffering the equivalent of an RAF Form 700 for his signature. The aircraft is a T.4 two-seater

displayed (as here) or flying; but even with the Avro 504K and Moth the opportunity has been glaringly missed of explaining their association with Croydon.

The set-piece last Saturday was a parachute "attack" on the airport. Two Beverleys and a Hastings disgorged over 100 parachute troops and their supplies, and two Whirlwind helicopters did a bridge-building act. This was good, exciting stuff, but with the general effect of the Shuttleworth exhibits, the recruiting stands for all three Services, the military bands and displays, and a parachuting tower for the adventurous visitor, commercial or any form of civil aviation suffered a complete eclipse. An historical display on the theme of the *airport*—based if need be on models, but supported by a civil fly-past with commentary—could and should have been staged.

Among the "local industry" stands were those of Louis Newmark Ltd and such familiar aeronautical names as Rollason Aerocessories Ltd and Field Aircraft Services Ltd, still active alongside the now defunct airport.

The pageant in Lloyd Park, Croydon (which event, like the exhibition, ends this Saturday, June 25) is an ambitious affair of 18 scenes and some 700 performers. Here again, the off-stage noise of Battle of Britain Hurricanes gives an unnecessarily military flavour to the modern sequence near the end.

IN BRIEF

Speaking on BBC television on June 17, Harold Watkinson, Minister of Defence, said "Sky Bolt is ideal for the Vulcan; for the Victor we might well consider the development of a British weapon, but we have got to decide that."

The Fairey Co Ltd announces the appointment of D. W. Lee-Smith, FCA, as its secretary in succession to L. S. Dawkins, who was appointed to the board last February. Mr Lee-Smith joined the company in 1949 as an assistant accountant.

Rolls-Royce have invited a number of specialists from other companies, including Bristol Siddeley Engines, to assist in tracking down the basic cause of the failure of a compressor disc in a Tyne turboprop (*Flight*, June 3).

After spending four days as the guest of the Swedish Government, Duncan Sandys, Minister of Aviation, said he was "immensely impressed with the efficiency of the Swedish air defence organization and its high state of readiness. . . . I was also very favourably struck by the quality of its aircraft and equipment."

We regret to record the death, in a gliding accident in Austria on June 16, of Miriam "Mickey" Gilbert, PhD, an instructor of Kent Gliding Club and formerly with Surrey Gliding Club. Miss Gilbert was piloting a sailplane which collided with another as both were approaching to land at Aigens, in the Enns valley of Northern Austria. For the past five years she had been a senior scientific officer in the Operational Research Branch of the Ministry of Aviation.

Today's (June 24) issue of our associated journal *The Autocar* contains a complete guide to the Le Mans 24-Hour Race; and this week's (June 23) issue of *The Motor Cycle* is a special number with the full story of the Senior and Junior T.T. Races.

Missiles and Spaceflight

Although several "boilerplate" Minuteman ICBMs have been conducting numerous tests for nearly a year, this is the first photograph to show an actual representative XSM-80. The hoist rig is lowering it into one of the two silos at Edwards AFB, which, after firing only eight out of 18 tethered shots, proved the feasibility of the single-hole concept

TITAN FIRINGS

Development of Martin's SM-68 Titan ICBM has so far been very much a matter of ups and downs. The debit side of the balance sheet was augmented on June 14, when a small charge (possibly the self-destruct device) of a missile due to be fired from Cape Canaveral was prematurely detonated. Joseph Sibble, a technician working on the system, was killed and nine others were injured. This was the first fatality at the Cape since missile testing began there in 1950.

Nevertheless the flight testing of Titan continues to make steady progress. The G-series of test vehicles has broken the run of bad luck experienced by the earlier Titans. Six in a row have flown successfully and the last five have gone the full range. All Titans are now fitted with the Avco Mk 4 re-entry vehicle, and superficially the final G-models could hardly be distinguished from the first operational missile.

Designation of the operational prototype Titan is the J-series, and the first of this batch is already at the Cape. An appreciable amount of instrumentation will be carried by the Js, but they will be otherwise identical to the production ICBM. J models for shipment to Vandenberg will be known as the V series, and the first of these is scheduled to be fired in October or November. Shortly afterwards the first VS (Vandenberg Silo) will be fired from one of the two underground Titan emplacements which are now almost complete at that base.

ASTRONOMER-ROYAL ON ROCKETS

When one has once acquired a particular reputation it is very hard to live it down; and Dr Richard Woolley, the Astronomer-Royal, will always be known as the man who four-and-a-half years ago described interplanetary travel as "utter bilge." Wisely, he has chosen to continue to attempt to justify this view, by arguing from a position which appears to be completely dispassionate and objective and entirely unswayed by any considerations of glamour or national prestige. He maintained this view when on June 15 he spoke at the annual luncheon of the Press Association in London.

He touched on most of the facts of life affecting his work, and suggested that one might lose as much as one would gain by transferring a programme of astronomical observation to a satellite. "All that I will say now is that there are many important astro-physical observations crying out for attention which would not benefit in the least by being transferred to satellites, and that the big argument for satellite astronomy is the far ultra-violet and that it is not too clear just what problems would be solved by rocketry." Dealing with space travel, he said, "It remains hideously expensive; the surfaces of the moon and planets are so inhospitable to life that there is no question of living on them; the difficulties of setting up a launching station to arrange for a safe return are enormous. The whole exercise of a genuine landing on a planet and the organization of a safe return is so difficult and so expensive that the value of the thing should be seen in some sort of proportion."

BUILDING-BLOCK BOOSTERS

Previously an almost unknown firm in the aeronautical and space scene, United Technology Corp of Sunnyvale, California, have revealed basic details of their concept for building up boost vehicles of all sizes from a number of integrated stage segments. Each stage is to consist essentially of a solid-propellant charge with hemispherical ends of differing diameters, so that the casing will taper with an included angle of some 8°. Transition pieces may be inserted between the segments, to transmit flight loads and fair over the thrust chamber of each stage.

UTC have already fired small conical segmented engines, and claim that all major fundamental problems have been overcome. They have a contract with NASA calling for the demonstration of feasibility, although this is unlikely to involve any stages with a thrust greater than 20,000lb. Many companies are investigating such arrangements for producing cheaper and better large boost vehicles, but this appears to be the first involving tapering segments.

BIS SPEAKS OUT

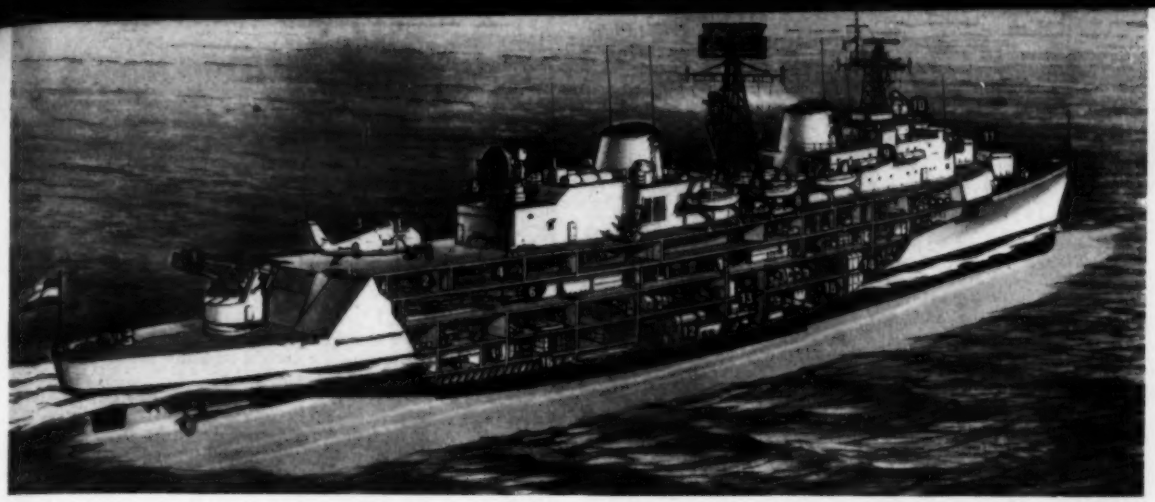
Although it was drawn up on February 24, the following text—reproduced slightly abridged—has only now been issued by the British Interplanetary Society. It was formulated as a confidential memorandum to the Prime Minister by a committee of 30, most of whom are members of the Society.

Recommendation A British entry in space activity on a more comprehensive scale than has hitherto been proposed has now become essential, if we are to maintain our position in world technology. Fortunately, in adaptations of Blue Streak and Black Knight, and in facilities such as Spadeadam and Woomera, we have the means—and have made much of the financial provision—for an early impact in a field which represents a marriage of the best in all the fundamental and applied sciences.

The main items of the suggested UK programme would be: the development of Blue Streak and a modified Black Knight as a satellite launching vehicle, in addition to expansion of satellite tracking and orbit analysis, and a more vigorous prosecution of the project to launch British instruments in the American Scout rockets; a later project for improved and more powerful second and third stages for a modified Blue Streak; detailed investigation of commercial and military communications satellites; research on hypersonic winged vehicles and their use for controlled re-entry; a modest programme on space-medicine; and a programme on new propulsion systems, such as the nuclear, ion and plasma rockets, and possible synthetic metastable propellants of great energy. Arguments in support of the above recommendation, and some further details, are given below

There has been an apparent official tendency in the UK to consider astronautics purely in terms of physical experiments (e.g., on the ionosphere or cosmic radiation) which can be performed with high-altitude rockets and close-orbit satellites. This is unduly restrictive in outlook: such subjects are a small, even though important, part of the whole. To emphasize the above point, which cannot be overstressed, British aviation policy in 1910 could not have been determined merely by considering aviation's influence on meterology and surveying.

Mankind is obviously entering a long new phase of exploration and development, comparable to the conquests of the oceans and the air but vastly exceeding these in scope. In this context the views of



The Admiralty have authorized publication of this drawing of HMS "Devonshire," the first guided-missile ship of the Royal Navy. Brief details were published in last week's issue; standard displacement is 5,000 tons (although the four ships of this class are rated as destroyers) and overall length is 520ft. The key is as follows: 1, twin launcher for AWA Seaslug missile; 2, CPO's mess; 3, Westland Wessex ASW helicopter; 4, crew dining hall; 5, guidance radar for beam-riding Seaslug; 6, main missile store; 7, quadruple launcher for Short Seacat close-range missiles; 8, ASW homing-torpedo tubes; 9, life rafts; 10, enclosed bridge; 11, radar-controlled twin 4.5in guns; 12, gas-turbine room; 13, gearing room; 14, boiler room; 15, after-turbine room; 16, fuel tanks. The entire ship is air-conditioned

historians and sociologists on the lessons of the past are as worthy of a hearing as are those of contemporary specialists in science and technology. What will almost certainly turn out to be a complete revolution in human affairs and progress cannot be ignored by this country.

It is appreciated that the UK cannot hope to compete on equal terms with the USA and the USSR. To assume, however, that we can therefore play no significant part at all would be a betrayal of our national future. By itself, the installation of British instruments in American satellites is not, in this context, regarded as constituting "a significant part." Leaving aside the ultimate implications that space exploration will have for the future of mankind, astronautics presents the most severe challenge to applied science and technology. Any nation that makes major contributions to it will derive considerable benefits.

Of the relevant non-technical considerations, that most often mentioned is national prestige. Less-developed countries will tend in future to judge the leading nations at least partly on the basis of their achievements in space. Such judgments will inevitably be reflected in their purchases of technical equipment of all kinds. Should the belief develop that Great Britain is lagging in this most important branch of technology, our status is likely to be undermined at international conferences when relevant problems come up for discussion. No-one could deny that Russia's success in space has established her as one of the two most advanced countries in science and engineering. Already this has had a marked effect on her position in international trade.

Allied to this question is that of internal morale. This is inseparable from the general sense of national achievement, the stimulus to technology, and the encouragement of new industries with new products. Astronautics will play a role here at least equal to that of aviation during the past fifty years.

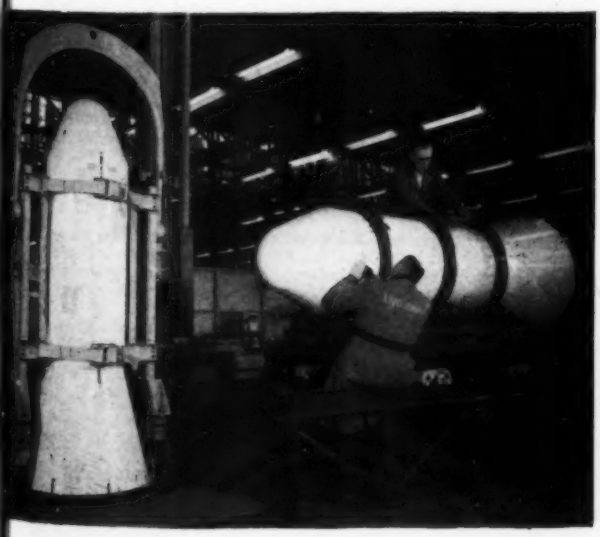
Apart from the above general considerations, there are important and specific military and civil developments which can be foreseen for the fairly near future.

These include the use of satellites for military reconnaissance, bombardment, early-warning, navigation, weather research and radio communications. The strategic and commercial importance of the last-mentioned application, in view of our Commonwealth communications requirement and its associated industry, should need no emphasis. The same might be said of possible future developments in rocket-propelled transport vehicles, capable of reaching the Antipodes within a few hours. On the military side, the development of any of these devices by a potential enemy would surely call for defensive means to be at our disposal.

It is believed that a significant British contribution could be made for an annual expenditure rising within five years to about £20m, and being maintained thereafter at about this level. The corresponding deployment of technical manpower would rise to about 1,000 graduate scientists and engineers (drawn from a wide variety of disciplines), with supporting technicians, industrial labour and facilities. This would satisfy the requirements of the programme outlined at the beginning of this memorandum. These figures assume the continuance of effort on relevant defence projects. If these were curtailed, the budgets specifically for space would need to be greater—as, in that event, they presumably could be. A very important consideration is the fact that astronautical projects could enable national techniques and skills to be maintained, against the possibility of any unfortunate future need to reverse disarmament policies.

Conclusion It is respectfully submitted that an early statement of Government policy, along the lines here advocated, should be made. This should courageously state the long-term objectives, and guarantee reasonable continuity in the effort involved; without the last proviso, workers of an adequate calibre will not be attracted into it.

It is thought that much of the world, especially the Commonwealth and Europe, is awaiting such a lead from us. If some such pronouncement is not soon made, there is a grave danger of accelerating the growing tendency for British research and development in the fields of applied science and technology to be associated almost entirely with unadventurous, short-term objectives of immediate military, commercial, and economic importance. If this state of affairs obtains, then the achievements of our scientists and engineers will become as limited as their objectives, and eventually there will be an inevitable decline in both the level of British applied science and technology and in the morale of the people involved.



The US Air Force have permitted Avco's Lycoming Division to release this photograph of Titan ICBM re-entry vehicles in final inspection at their plant in Stratford, Connecticut. Avco make both the RVX-3 and RVX-4 cones seen here, and the similar operational Mk 4 cone

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Sea trials with the Short Seacat ship-to-air missile are shortly to begin, from HMS *Decoy*.

During a demonstration of engineering feasibility at White Sands on June 10, a Nike-Hercules intercepted and destroyed a Corporal ballistic missile.

The West German government hastily denied last week that they have any interest in strategic missiles (although the West German army is being equipped with TM-76B Mace). Previously it had been suggested that the Bundeswehr was interested in acquiring Polaris.

The US Defense Department stated on June 12 that it plans to launch Project Banshee next Spring, to learn more about space as a military environment. One of the experiments will be the detonation of 500lb of conventional explosive 24 miles above southern New Mexico; a balloon will be used for this purpose.

According to the London *Daily Express* the United States will not permit Britain to offer Blue Streak as a first-stage for European co-operative space projects, owing to the fact that secret information from the Atlas ICBM programme was used to assist the development of the British LRBM.

Middle East Argosy

WITH last week still a golden blur of Rome, Athens, Beirut, Malta and Nice, I find myself hard-pressed to be dispassionately factual about the latest proving-flight of the Armstrong Whitworth Aircraft Argosy G-APRN. Perhaps to ride in comfort three miles above a summer Europe and smiling Mediterranean and to visit the classical cities is too soft an introduction to the Argosy's businesslike abilities; but it so happened that the sector of Romeo November's proving in which *Flight* was privileged to participate lay that way—and to the headquarters of Trans Arabia Airways, whose order for two Argosies was announced in *Flight* for March 18; and no one scorns a visit to the Mediterranean. It was no holiday trip, however, for the hard-working AWA staff aboard: for them it was merely Phase 3 of the intensive route-proving of what they understandably consider to be a tough and efficient transport aircraft.

G-APRN is the fourth of the six Argosies which have so far flown and is being used as a demonstrator. Aircraft No 7 is to be submitted in the near future for C of A approval, and to this end the company have subjected Romeo November to concentrated route-proving in Europe and the Middle East. Up to last Friday, when it returned from Nice to Birmingham, approximately 200 hours of intensive flying had been completed since May 11. Romeo November was due to be off again to the Middle East last

By HUMPHREY WYNN

Wednesday, and by about July 10 will have completed 300hr, marking the end of Phase 4. But that is to anticipate a story which began at Birmingham Airport on Tuesday of last week, when a proving-flight crew of 11, plus 12 passengers, boarded Romeo November for an 0800hr take-off for Rome.

The Argosy's crew was headed by the AWA chief test pilot, Eric Franklin, and included servicing engineers to supervise refuelling and maintenance. With Franklin as co-pilot was the deputy chief test pilot, Bill Else; and two operations officers, Peter Rowley and Gordon White, occupied in turns the third position (normally for radio operator or flight engineer) on the flight deck. With Franklin and Else as far as Athens was a third pilot, Capt Frank Lloyd, chief training pilot of Trans Arabia Airways: he went on by a night scheduled service and met the aircraft on its arrival at Beirut. To look after passenger comfort and add a glow of feminine charm was Miss Merry Warner of the AWA publicity department, a most competent stewardess.

In giving the names of everyone on board Romeo November I am not being pedantic but underlining the amount of organization that goes into these route-proving trials. Working them out has been largely the responsibility of Freddie Sanders, flight test and development manager; and with him on this trip was his able lieutenant Jim Harper, assistant contracts manager. Brian Hough, sales manager, went as far as Beirut, where he was staying for a few days of business talks.

The rest of Romeo November's complement was made up of a servicing team, AWA passengers and three journalists. The team consisted of Tom Saunders, section leader, flight test; Mick Manley, inspector; Jack Ager and Joe Clarke, fitters; and Dennis Javes, senior electrical field-service engineer. The aircraft, which carried spares and servicing equipment (3,300lb of freight all told), was thus a self-contained unit; and it should be noted at the outset that only one unserviceability occurred, and that a minor one, in 22hr 55min of flying with seven take-offs and landings. This was at Beirut, when the fire-warning light on No 3 engine came on before take-off. The trouble, caused by chafing of a fire-detector wire on No 3 engine, occasioned a delay of only 1½hr.

The other AWA passengers were Alan Thomson, assistant service manager (technical); Johnny Nicholls, assistant service manager (administration); John Austin, assistant chief inspector; and John Davis of the publicity department. Mel Ebbutt, chief engineer of Trans Arabia, came as far as Beirut. Non-AWA passengers were Roy Burdett of the ARB, John Stroud the freelance air-transport journalist, Ahmed Suleiman of the BBC's Arabic service, and the writer. Here a warm word of thanks to AWA seems timely, for the hospitality and friendship their guests enjoyed throughout the trip.

Phase 1 of Romeo November's route-proving consisted of 50 hours' day and night flying, to Continental airports and Benghazi; Phase 2, an intensive 75hr by day and night; Phase 3, of which the flight under discussion formed the conclusion, 75hr; and Phase 4, from last Wednesday until approximately July 10, is to be of 100hr—giving a total of 300hr.

The passenger cabin, aft of the freight compartment, is set out in a configuration of 12 rearward- and 12 forward-facing seats. Its decor, in plain grey, was designed by AWA to show potential customers a typical arrangement. The ratio of passenger/freight space is quickly adjustable according to requirements. Romeo November has a galley designed by W. Henshall & Sons (Addlestone) Ltd, with heating units by GEC. There are two toilets, one in the front-opening freight door and the other at the rear.

A route-proving flight such as this may perhaps be described in two ways: from the æsthetic point of view, concentrating on the appeal of flying in a comfortable aircraft, buoyed up confidently by four Rolls-Royce Dart 526s; and from the statistical angle, on the basis of figures assiduously compiled by the operations officers. Probably a happy mean is to include something of both, showing the Argosy from a crew's, operator's and passenger's points of view.

To get the statistical record straight, here are figures giving the basic details:—

Stage	Dist. (n.m.)	T.-o. wt. (lb)	Ht. (ft)	W./V. (kt)	T.A.S. (kt)	Time (min)	Fuel (lb)
B'ham-Rome	952	83,098	19,500	+15	220	270	13,250
Rome-Athens	645	79,883	15,5/17,5	+ 9	220	185	9,470
Athens-Beirut	628	79,768	15,500	+25	225	180	9,477
Beirut-Athens	623	79,553	14,500	−15	225	200	10,383
Athens-Malta	502	77,553	16,000	−19	225	150	7,590
Malta-Nice	630	79,718	16,500	−23	230	180	9,257
Nice-B'ham	694	79,718	16,500	−30	230	210	10,570
	4,674					22hr 55	69,997

During the trip I had useful discussions with Eric Franklin and Bill Else about flying the Argosy. They have been intimately concerned with it from the beginning, and their work is reflected in the sensible and convenient layout achieved for the two pilots' positions. On several visits to the flight deck I sat on the rumble seat behind them, and was impressed especially by two things: the comfortable width in which they worked, and the constant amount of work to be done when flying airways, even in such gin-clear conditions. Franklin made the point to me that, as a test pilot, he found airline procedures a new experience: I can only say that from my observation, he and Else seemed to be operating them like old hands. At Rome (Ciampino) we had our only airline delay, having to wait three-quarters of an hour for take-off clearance, then lining up ninth in the queue behind scheduled services.

From the operator's point of view, the Argosy (at a selling price, I was told, of around £485,000) looks a thoroughly worthwhile "buy": its mixed configuration gives it useful versatility; its front-opening door (there is also a full-width rear door) and low ground stance fit it admirably for the freight role; its powerplants are supremely well-proved; and to date the six Argosies flying have successfully logged a total of 1,500hr.

Looked at from the passenger angle, the Argosy offers interest and comfort: noise-level is comparatively low and the high wing gives good outward visibility, though it blanks off much natural light and hence there is constant lighting demand on the aircraft's electrical supply. Technically minded passengers may enjoy watching the retraction and extension of the sturdy Dowty landing gear (I was reminded of the similar enjoyment I used to get in the AWA's Ensign). Inboard flaps are also visible from the windows, and an adverse comment I might make concerns the noisiness of flap operation, a sound likely to disturb passengers unacquainted with its source.

One adverse comment is hardly detrimental, however, in a round trip of 4,674 n.m. during which Romeo November was operated with unassuming skill and efficiency. In Phase 4, the aircraft is to get well acquainted with Middle East routes—operating into Beirut, Kuwait, Bahrain, Teheran and Cairo. Having participated in Phase 3, I feel on good ground for wishing AWA every success in the rest of their route-proving, and look forward to seeing the Argosy win its C of A and go into service.

IVCHENKO AI-20 TURBOPROP

IN view of the dearth of information on Russian engines we are glad to publish brief details of the neat single-shaft turboprop developed by A. Ivchenko's design bureau and which was successful in ousting Kuznetsov's NK-4 as the standard powerplant of the Il-18 Moskva transport.

Essentially the design strongly resembles that of the Napier Eland. Like the British engine it is a single-shaft unit, with a ten-stage compressor, tubular combustion chamber with ten burners, and a three-stage turbine.

Engine speed at flight idling is 10,400 ±200 r.p.m., or 12,300 ±90 r.p.m. under all other flight conditions. Maximum turbine-entry temperature is 520°C. Rotation is anti-clockwise when viewed from the rear and the planetary reduction-gear drives at 0.08732 : 1 to the 14ft 7in AB-68I propeller, the four blades of which have automatic feathering and ice protection (as detailed on page 867).

BIG-LEAGUE GLIDING

2 — NICHOLAS GOODHART GAINS, LOSES AND REGAINS A SUBSTANTIAL LEAD AT BUTZWEILER

Butzweiler, nr Cologne

THE most discussed day in world-contest gliding for many years past (and to come) may well have been **Saturday, June 11,** when the task set at the World Gliding Championships at Butzweiler was distance along a fixed line. The line lay through Karlsruhe along a true course of 155°, and when extended passed through Lake Constance in Switzerland—a supremely academic point, as events were to prove.

Weather prospects were not good. A ridge of high pressure had developed over southern Germany, but yet another depression was coming over to us from the United Kingdom. A belt of rain was ahead of it, and indeed cirrus and cirro-stratus cloud had already reached our area. Towards the south this high cover was expected to decrease and conditions along the route generally were expected to improve.

The front moved in more quickly than had been expected, and many pilots were forced to land back at the airfield as the rain came down and the breeze stiffened the tribune flags. Other pilots landed away after short flights and returned to try again; they included Anthony Deane-Drummond, but he came down again on the other side of Cologne. Although the British team had been praying for some good-old-English marginal weather, this was rather too marginal.

By KENNETH OWEN

A distinguished and popular visitor to Butzweiler on this day was ex-world champion Philip Wills who, after sitting-in on the morning briefing, had the new experience of staying on the ground and keeping in touch with pilots' progress via the radio and maps in the British team tent. How did he feel about being at a world championship meeting and not flying? It was, he said, rather a bore.

Meanwhile the brothers Goodhart were having a time that was anything but boring. In the Skylark 2 Anthony was ridge-soaring on the east of the Rhine just south of Bonn. This he did for 45min before setting out in search of thermal lift to the east, but conditions were so bad that it proved to be his final glide for the day. Had he made a straight glide on track instead of this detour to the east he would certainly have exceeded 50km and the Standard Class would have had a contest day (and A. Goodhart would have picked up a useful handful of points). The only Standard Class pilot who did succeed in exceeding 50km was Huth in one of the two Ka-6s to be fitted with an all-flying tail; his distance was 60km, but as the rules required at least two pilots to exceed 50km for the task to rate as a contest day he received no points for this worthy flight.

An even worthier effort was that of Nicholas Goodhart, who had progressed from a 4,000ft smoke thermal south of Cologne and headed for the same ridge east of the Rhine. The ridge itself had produced a line of thermals which had taken him towards Koblenz, after which he had worked his way eastward away from the river. Turning back towards the set track, he was eventually forced to come down opposite Boppard, on the Rhine, landing on the top of a spur around which the river curved in a hairpin bend. In the day's appalling weather conditions this was a classic flight—an actual distance of 96.6km and a scoring distance of 86.2km.

"Flight" photograph

Oda (Japan) on tow behind one of the Do27 tugs

The only other pilot to exceed 50km in the Open Class was Harald Jensen of Denmark, flying a Ka-6, whose distance flown was 107.9km but whose deviation from the set line was such that his scoring distance was only 44.8km. Only five other pilots exceeded 20km: Hossinger, Gaze, Makula, Popiel and Haase.

The significance of Jensen's flight was realized almost immediately, for it was arguable whether the rule referring to "at least two pilots" flying "further than a minimum distance of 50km" was intended to mean actual distance, projected distance on to the set line, or marking distance (in which the distance off track is subtracted from the projected distance).

Whatever the rule was intended to mean, what it said was simply "distance," and this interpretation was confirmed the following morning, **Sunday, June 12,** when Ernst Frowein announced at the 9 a.m. briefing that the previous day had been a contest day for those in the Open Class but not for those in the Standard Class. Briefing for the day was postponed until 12.30 p.m.

At the second briefing, the day was declared a rest day because of another depression approaching from the British Isles, with associated rain and eight-eighths strato-cu over the Butzweiler region. But it was also announced that there would be a meeting of all team captains (the international jury) at six that evening "to discuss questions arising from yesterday's flying."

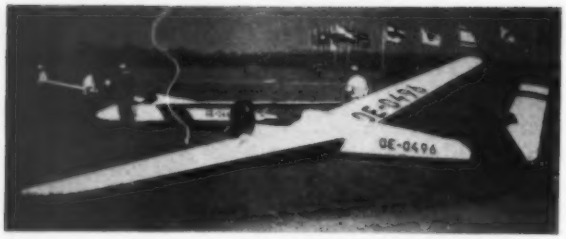
The points totals of the leaders on the basis of the 9 a.m. briefing announcement were now:—

Open Class: 1, N. Goodhart, Britain, 3,783 points.
2, Makula, Poland, 3,173.
3, Hossinger, Argentine, 3,142.
4, Popiel, Poland, 3,130.
5, Haase, West Germany, 2,933.
Standard Class: 1, Witek, Poland, 2,957.
2, Fritz, Austria, 2,921.
3, Huth, West Germany, 2,779.
4, Juez, Spain, 2,732.
5, Resch, Austria, 2,722.

In the absence of contest flying on Sunday, evaluation of the Standard Class aircraft entered for the OSTIV prize began. The judges were Hans Zacher, West Germany; Julian Bojanowski, Poland; Georges Abrial, France; Boris Cijan, Jugoslavia; and Hans Brückner, Austria. Originally Lorne Welch was to have served on the panel as British representative, but in his absence from the championships it had not proved practicable (because

On tow: the Fauvette flown by Arteman (Argentina) and, right, Popiel's (Poland) Zefir. Both Zefirs headed the Open Class almost every day

"Flight" photographs



The two Standard Austrias which, flown by Fritz and Resch, put up consistently good performances. Below, the Zugvogel 4A (in foreground) and 4, flown by Persson and Jonsson, await launching
"Flight" photographs

BIG-LEAGUE GLIDING . . .

of crewing duties) for Frank Irving to take over as had been hoped.

The sailplanes which had been entered for the prize were the Standard Austria, Foka, E/C 39, Pik 3C, Ka-6, Skylark 2, M.100S and (not entered in the championship) the K-8. If time allowed, the panel would also examine the Fauvette, Schweizer 1-23H, Zugvogel and Mucha Standard.

The evening meeting of the international jury proved inconclusive, except that formal protests against the "distance" interpretation were made by Poland and West Germany, and a further meeting was arranged for the following day, **Monday, June 13.** For reasons of weather and of flight safety, as Dr Frowein phrased it, this day also was a rest day.

The jury met at 6 p.m. on Monday, and four hours later emerged to eat, having reached a decision on the thorny problem of what the rule said and what it was meant to say. By a vote of 12 to eight, with one abstention and two countries not represented at the meeting, the verdict was that "projected distance" only should count. This meant that the decision that Saturday was a contest day for the Open Class was reversed, and that Nicholas Goodhart was no longer in the lead.

This decision came as a bitter disappointment to the British team and, in particular, to its captain Ann Welch, whose main argument had been that the rules as written and accepted in advance by every team should not be changed retrospectively during mid-contest. Also relevant was the increasingly widespread feeling among many of the teams that the organizers had in fact invited this sort of problem by their unimaginative task-setting. Although the luck element must not predominate, the reasoning behind this criticism was that the more difficult the weather the more scope the pilot should have to exercise his skill.

On the narrow question of the distance rule, there was no doubt that most pilots agreed that, as written, the rule was wrong and did not express what was intended. But this wider point was also clear—pilot skill was way ahead of task-setting ability at this world championship. These two factors had come together in the most unfortunate way, and the only unanimous feeling on this was admiration for the skill of Goodhart and Huth on their Saturday flights.

On **Tuesday, June 14,** the set task was again open to much criticism. With strong cumulus building up against a blue sky at breakfast time, it was obviously going to be a good day, and pilots were surprised to hear that they were to fly a goal race to Oerlinghausen, a distance of only 162km, or almost exactly 100 miles. Over a specified area *en route*, cloud-flying would be allowed.

No fewer than 51 of the 55 pilots were successful in reaching Oerlinghausen, but among those who were not was Anthony Deane-Drummond in the Skylark 3F. Anthony Goodhart in the Standard Class Skylark 2 set up a better time than his brother, but it was "just one of those days" in which things failed to click for the British team.

On several occasions during the championships the Standard Class aircraft had shown performances equal to those of their seniors in the Open Class. Today the best time to Oerlinghausen was set up by a Standard Class machine, and there were no prizes for guessing that it could have been—and in fact was—the Polish Foka flown by Adam Witek. His time was 1hr 15min for the 100-mile journey—no less than an 80 m.p.h. average, if you please.

Makula and Popiel in the Open Class Zefirs took 1hr 17min, and behind them came Schreder's Airmate HP-8 and Johnson's RHJ-6 (which by now had been dubbed "the mahogany bomber") with 1hr 24min and 1hr 25min respectively. At 1hr 27min Huth was runner up to Witek in the Standard Class.

What could one say, except that the Poles seemed to have the championship in their pockets? On each contest day, Makula, Popiel and Witek had picked up 1,000 points apiece. For sheer high-performance consistency this had not been approached in any other world championship. It was not simply a case of good pilots flying good sailplanes; it was a high-performance soaring system, a computer into which was fed weather, pilot and aircraft and out of which came points—in batches of 1,000. The leading points totals were now:—

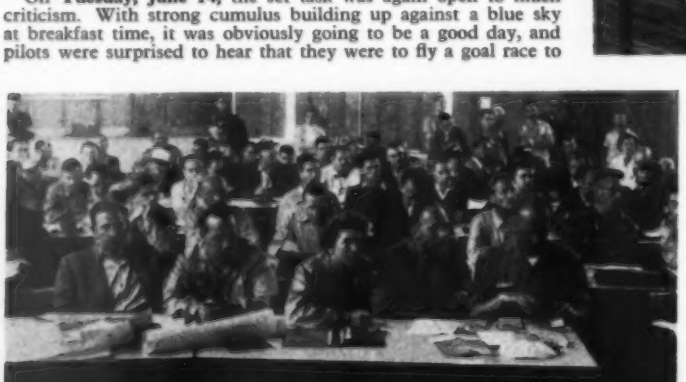
Open Class: 1, Popiel, Poland, 3,965.2 points.
2, Makula, Poland, 3,926.2.
3, Haase, West Germany, 3,630.8.
4, Marchand, France, 3,549.4.
5, N. Goodhart, Britain, 3,529.1.
Deane-Drummond was tenth with 3,018.1.
Standard Class: 1, Witek, Poland, 3,956.9.
2, Fritz, Austria, 3,746.8.
3, Huth, West Germany, 3,654.4.
4, Resch, Austria, 3,566.4.
5, Juez, Spain, 3,510.5.
Anthony Goodhart was 26th with 2,434.8 points.

The day we learned that machines are not infallible and that systems can break down was **Wednesday, June 15.** The high-pressure area was still intensifying in France and central Germany, the air mass was unstable, winds were light from the west, and the cumulus cloudbase was expected to rise from 1,000 to 1,500 metres. In these apparently fair conditions the day's task was to be a 300km triangular race with turning points at Hamm and Hirzenhaim. Cloud-flying was again permitted over a certain section of the route.

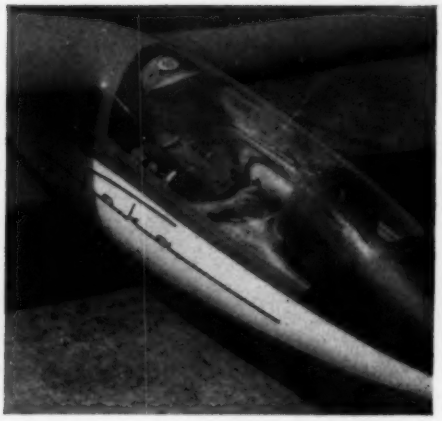
For many pilots the day's flying ended near Hamm, the first turning point, where the main trouble was a severe line thunderstorm which dominated this part of the triangle. As the landing reports came in we learned that even the mighty Poles were down somewhere along the second leg. This could be the day.

It was. At eight minutes past four Huth in his Ka-6 was first man home. Six minutes later Nicholas Goodhart's red-and-white

Briefers: Dr Ernst Frowein (left), head of the panel of judges, and Heiner Lange, interpreter from the German into English and French . . .



. . . and briefed. In the foreground are the British team—left to right, Anthony Deane-Drummond, C. E. Wallington (team meteorologist), Ann Welch (captain), Anthony Goodhart and Nicholas Goodhart



"Flight" photograph

The judges for the OSTIV prize in the Standard Class watch the Italian M-100S (pilot, Silva) being rigged. Right, the slim line of the Polish Foka is gained by semi-reclining the pilot—Adam Witek, who gained the Standard Class lead on the second day of the championships

Olympia 419 approached low over the airfield road, floated slowly across the field, crossed the finishing line at a height of 4in and touched down (not because he pushed the nose down but because he could not go any farther) 30ft farther on.

The tension in the British tent broke with a groan of relief. We knew about not having excess height to spare on a final glide, but this was impossible. At 4.23 Neils Sejstrup of Denmark came in with plenty of height to spare in the red-tipped silver Ka-6, and the finishing line observers could have packed up and gone home. That was it.

Three pilots who came down only a few kilometres short were Hossinger, Toutenhoofd and Bikle. For the Standard Class, two had completed the course and the race had officially taken place. But in the Open Class Nicholas Goodhart was again robbed of points by being too good: as no other pilot had completed the triangle the Open Class marks were awarded on distance alone (i.e., no marks for speed).

The position had now changed completely and in spite of everything the British Olympia 419 pilot was now back on top in no mean fashion. The day's leading pilots included some new names. First five in the Open Class were Goodhart, Hossinger, Ortner, Van Bree (who had replaced the Dutch pilot Seyffer, taken ill) and Jonsson, and in the Standard Class Huth, Sejstrup, Bikle, Rautio of Finland and Münch of Brazil.

So now we had excitement, with a maximum of only two more contest days to go. As Nicholas Goodhart entered the crowded dining-hall that evening he was greeted by a spontaneous and prolonged burst of sincere applause. Both he and Huth had given the complete answer to the arguments and wrangling about last Saturday's flying. They had repeated their high performance in tricky weather. It had not been luck on Saturday and it was not luck today. This was sheer pilot skill in good but not superlative aircraft. Total points were now:—

Open Class: 1, Nicholas Goodhart, Britain, 4,528 points.
2, Hossinger, Argentine, 4,366.8.
3, Makula, Poland, 4,250.7.
4, Popiel, Poland, 4,213.1.
5, Ortner, Argentine, 4,206.

Standard Class: 1, Huth, West Germany, 4,654.
2, Juez, Spain, 4,286.5.
3, Münch, Brazil, 4,269.3.
4, Sejstrup, Denmark, 4,254.3.
5, Witek, Poland, 4,188.6.

(To be concluded)

BIRTHDAY HONOURS IN AVIATION

IN last week's issue we noted the names of a number of people in the Queen's birthday honours list, and a more detailed list appears below. The names are from the civil divisions of the various orders: Service honours and awards were given on page 832 last week.

Knights Bachelor: P. Ll. Hunting, chairman, Hunting Group; Dr G. B. B. M. Sutherland, Director, National Physical Laboratory.

CB: J. S. McPetrie, Director-General, Electronics Research and Development, MoA.

KBE: AVM W. A. B. Bowen-Buscarlet, chairman, East Lancashire Territorial and Auxiliary Forces Association; R. Cockburn, Chief Scientist, MoA.

CBE: T. E. Allibone, director, research laboratories, Associated Electrical Industries Ltd; A. H. Milward, chief executive, BEA; Gp Capt J. P. Ryland, general manager, Trans-Australia Airlines; R. A. Smith, Chief Scientific Officer, Royal Radar Establishment; J. C. R. Woodside, Deputy Director of Works, Air Ministry.

OBE: F. W. Bates, works director, Kelvin & Hughes Ltd; Capt A. D. L. Carroll, staff pilot, Civil Aviation Flying Unit, Stansted, MoA; R. J. Clayton, manager, G.E.C. Applied Electronics Laboratories; W. H. Crowther, manager, Western Division, Qantas Empire Airways; F. H. Dight, lately chief meteorologist, Hdqrs, Coastal Command, Air Ministry; G. M. Harvey, managing director, British Oxygen Wimpey Ltd; A. E. Mason, lately managing director, BP Refinery (Kwinana) Ltd and director, BP Australia Ltd; L. F. Masters, superintending Civil Engineer, No 7 Works Area, Air Ministry, J. J. G. Michie, head of Commercial Division, John Laing & Son; H. G. R. Robinson, principal scientific officer, MoA; J. A. Rugless, principal, MoA; F. H. Saniter, director of research, United Steel Companies Ltd; Lt-Col J. B. Skinner, Scottish Air Cadet Council; P. J. W. Summerfield, senior chief executive officer, Air Ministry.

MBE: W. H. Calvert, assistant chief constable, No 2 Area, Air Ministry Constabulary; D. Cemm, engineer, Aeronautical Inspection Directorate, MoA; D. N. J. Cole, chief engineering draughtsman, Vosper Ltd; F. A. Dennis, higher executive officer, Air Ministry; R. P. Farley, inspector of armaments, MoA; B. J. Folliard, inspector of accidents, BOAC; W. R. Groves, superintendent, Short Bros & Harland Ltd.

J. Harper, chief liaison engineer, Admiralty contracts, Heenan and Froude Ltd; R. P. Hartley, for services to civil aviation in Rhodesia; H. Heason, higher executive officer, Air Ministry; Rev H. P. Jones, officiating chaplain, RAF Wattisham; T. V. Keelan, assistant education officer, Plastics Division, ICI; H. E. Kelly, chief aeronautical inspector (aircraft), Department of Air, Australia; G. Killen, senior technical superintendent (engineer), No 22 MU, RAF Silloth; E. G. Longman, executive director, Hoffman Manufacturing Co Ltd; G. F. Midwood, lately engineer II, Royal Aircraft Establishment; G. A. Morris, higher executive officer, MoA.

R. G. Protheroe, manager, Purfleet Terminal, Esso Petroleum Co Ltd; W. T. Rimmer, chairman of committee, No 273 (Wallasey) Sqn, ATC; Obs Cdr H. Robens, Deputy Area Commandant, Western Area HQ, ROC; R. W. H. Robinson, process superintendent, Folland Aircraft Ltd; J. I. Ross, senior executive officer, No 7 MU, RAF Quedgeley; Capt J. Slade, senior pilot, Northern Territory Aerial Medical Service (Australia); Mrs L. W. Smith, clerical officer, Air Ministry; H. E. Watson, senior executive officer, MoA; G. H. Whittaker, formerly engineering technician Grade 1, Royal Aircraft Establishment.

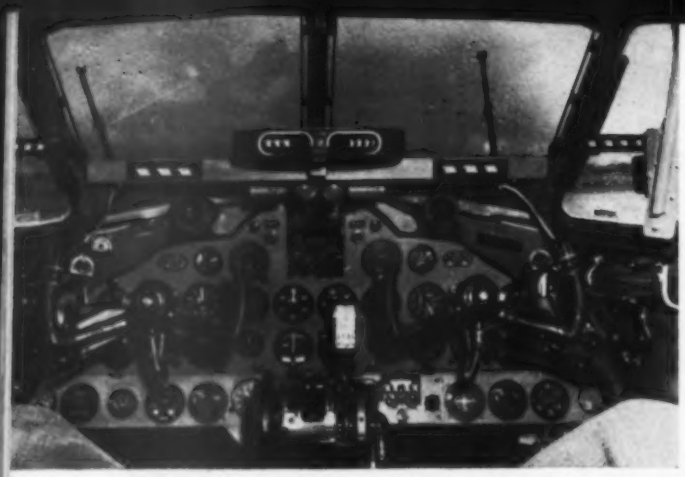
Imperial Service Order: W. E. Dockrill, chief executive officer, Air Ministry; F. W. Mugridge, chief executive officer, MoA.

Queen's Commendations for Valuable Service in the Air: Capt R. Hartley, senior captain, 1st class (flight operations), BOAC; Capt R. Hrycak, pilot, Nigerian Airways; Capt W. J. Wakelin, senior captain, 1st Class, BEA.

BEM: G. H. Bettes, driver, mechanical transport, RAF Hawkinge; A. S. Clark, chief instructor, No 155 (Maidenhead) Sqn, ATC; A. Constantinides, foreman of trades, Air Ministry, Akrotiri, Cyprus; G. F. Coppock, principal foreman of stores, RAF Heywood; Mrs L. M. Cornwall, senior chargehand, Electronics Group, Plessey Co Ltd; J. T. Elliott, airport foreman, Stansted Airport, MoA; W. P. Elms, lately fitter airframe, RAF Technical College, Henlow; Miss S. MacC. Holloway, communications officer, Birdlip Radio Station, MoA.

F. R. Languth, chief observer, Post 1/C, No 1 Group, ROC; C. S. T. Lavers, chief observer, Post 5/C, No 5 Group, ROC; E. D. F. Lawrence, research and development craftsman, Royal Aircraft Establishment; L. R. C. Percival, foreman, Rocket Propulsion Establishment, MoA; A. G. Raby, non-technical class, Explosives Research and Development Establishment, MoA; L. Richmond, ironworker, Royal Aircraft Establishment; Miss H. Smullian, voluntary welfare worker, RAF Rehabilitation Unit, Headley Court; W. Thorley, foreman of trades, RAF Shawbury; W. J. Whitby, foreman, Rotax Ltd.

FLIGHT SYSTEM SURVEY



Smiths PVD indicators in Dove G-AOSE at Cranfield. Shutters obscure them when they are switched off or otherwise out of action

Flying with Smiths' PVD

JUST over a month ago, Smiths Aviation Division first revealed details of the revolutionary Para-Visual Director at the 13th IATA technical conference in Lucerne; and *Flight* summarized the paper on May 13. Last week I was able to fly the Smiths Dove G-AOSE from Cranfield and make two ILS approaches using the PVD. It is certainly the most significant development in instrumentation I have yet seen and it aroused very considerable interest during demonstrations to IATA delegates at Lucerne. I was able, for instance, to make an accurate ILS approach down to about 30ft while staring fixedly at an ammeter or r.p.m. gauge in the cockpit and, conversely, to maintain the ILS approach path while looking ahead at the runway. The commands given by the striped indicators were unmistakable and compelling; and it took me only a few minutes to become accustomed to the display.

The development background of PVD was given at some length in *Flight* for May 13. It is enough here to recall that the display consists of black rods with spiral white stripes arranged in the field of view of the pilot so that one rod is athwartships directly in front of him and two more are to either side and slightly toed in. When the rods rotate they show a moving line of alternate white and black lozenges which instruct the pilot to move his controls in the same direction as the movement of the pattern. The indicator directly in front will tell the pilot to turn the aileron wheel left or right to initiate a bank, and therefore a turn. The two lateral indicators move together to tell the pilot to pull the control column backwards or push it forwards. The indicators act like the needles of a Zero Reader, giving the pilot commands for control movement. They remain stationary when the aircraft attitude is correct to achieve a given manœuvre or flight path.

In the Smiths Dove the command signals are derived from the Smiths Flight System, the azimuth channel being directly linked to the SFS for flying selected magnetic headings or capturing and holding ILS localizer. The pitch channel includes a separate datum unit for fixed-attitude flying and an ILS glide-path may also be connected. This installation is intended purely to illustrate the potentialities of PVD. In other aircraft, complete automatic landing sequences, VOR azimuth coupling and height and speed locks have also been incorporated. The rate of movement of the rotating rods is non-linear in relation to deviation from datum. For a steady increase in degrees of pitch error, initial response is slow and the rate of increase of rotation then increases fairly sharply before finally levelling off at a maximum demand speed. The maximum rate was not fast enough to cause blurring of the pattern and therefore uncertainty as to its direction of movement. The threshold is also very sensitive and smooth.

The outstanding feature of the PVD display is that, for the first time, it provides a signal which can be excessively powerful. Indicators 18in long were first used but these have now been reduced to 4in because of the strongly compulsive effect of the indications. The indicator in fact "shouts" at the pilot and it is difficult to deviate from a given flight path. For instance, the pitch control was set to maintain 1,200ft altitude, but in fact "zeroed" at 1,150ft. I found it extremely difficult to gain the extra 50ft by the altimeter without being almost driven down again by the PVD.

I have very little experience of ILS flying, but found no difficulty in making an accurate approach. My two approaches at Cranfield with PVD in the Dove were, for instance, much more accurate than two ILS approaches I made at Hatfield in a Twin Beech with the Lear LIFE integrated instruments. Other pilots had very similar experiences. On my second approach, R. A. Palmer, the Smiths pilot, took the Dove over on the glide-path and dived it sharply away to one side. The PVD indicators drove me back on to the beams with hardly any hunting and I was completely settled again long before reaching the threshold.

I had, incidentally, never flown a Dove before and, in addition, found its very modern instruments aggravatingly unfamiliar. After reaching 30ft on each approach the pilot applied full power and set a pitch demand suitable for an overshoot and I had no difficulty in establishing a steady climb on a fixed heading. The approaches were all made at between 110 and 130kt, speeds representative of large airliners.

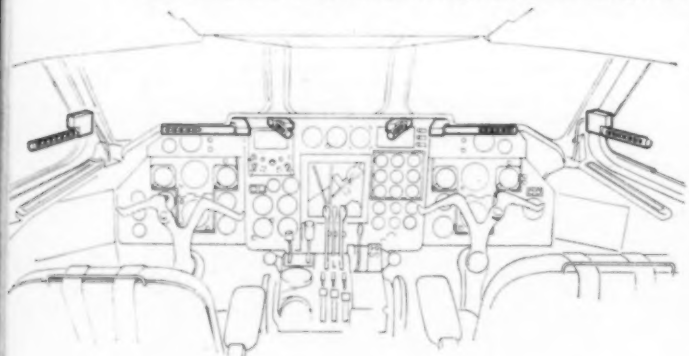
The Dove was so pleasant to fly virtually blind that I asked Smiths whether they had ever tried it in something less docile. They replied that in Ansons and Varsities it had also peformed well. The Varsity has much higher lateral inertia than the Dove.

There seems to be no problem in the actual geometry of the PVD layout, slightly longer indicators would easily counteract increased eye-to-indicator distances or wider separations. In the Dove the pitch indicators are little more than a foot from the eyes and slightly below eye level. According to Smiths calculations of the eyes' field of vision they are in a slightly poorer zone than the azimuth indicator, but there are two of them. Two are provided also because a single unit might give a lop-sided indication which could in some circumstances be misread or uncomfortable. I found that, initially, I had to sharpen up my awareness of peripheral vision in order to notice the indicators, but this took only one or two minutes. Smiths have tried about two dozen different patterns of streamer displays but the PVD proved to be the best. It seems immaterial whether the pattern is produced by shadows on light zones, lights on shaded zones, actual lights or painted stripes. The last-named has the slight advantage in having a better threshold.

The first civil operational application of the PVD will probably be in the D.H.121 airliner for BEA, although the actual hardware involved is little enough to be incorporated as a retrospective modification in most existing airliners. It is planned that early D.H.121s will have a duplexed control system—although the flying controls will probably be triplexed—provided with autoflare so that a malfunction in one of the two autopilot channels will cause both channels to disengage. The PVD will form a complete third channel with its own radio altimeter, computers and other accessories. During an automatic approach the PVD indicators will remain shuttered and any malfunction in that channel will therefore not be apparent to the pilot in the indicators themselves. In the event of an autopilot malfunction automatic control will be disengaged and the PVDs immediately revealed so that the pilot could take over and complete the landing manually. Such manual take-overs have been successfully achieved in practice at heights down to 20ft. With present equipment standards, this two-and-a-half channel arrangement would show a 1 in 10^{-7} risk of failure.

The most striking impression of flying the PVD-equipped Dove was that I knew positively that I was on the localizer and glide path, close to the ground, although I was deliberately staring hard at an r.p.m. gauge or an ammeter. There seemed to be no difficulty in doing this and yet, in the short time available, I was not able to become accustomed to other new instruments. PVD also fulfils what must be one of the major requirements of any director presentation: it is immediately understandable. Other applications might be as a rate of descent monitor or a height director in VTO machines.

MARK LAMBERT



PVD indicators as they will appear in the D.H.121 cockpit. They will have their own radio and computer channels

The apron at Edwards showing (from left, rear) NB-58A with J93 pod, B-66 with aft-fan engines, B-47, NC-130B with flap blowing, CV-880 and C-54; (front) F-107, F-104D, F-102A with J85 pod, F-101B, T-33A, T-37A and F4D with aft-fan model

DESERT DISPLAY

Edwards AFB Shows Its Changing Face

By ROBERT D. ARCHER, ARAeS

DRIVING north to Edwards Air Force Base for the annual Armed Forces Day show, on May 1, we passed through Palmdale and noticed that it looked almost like a ghost town—a by-product of the continued decline in the development of new aircraft for the US forces. This made us wonder how many aircraft would be presented for public viewing and close inspection at the sprawling desert base.

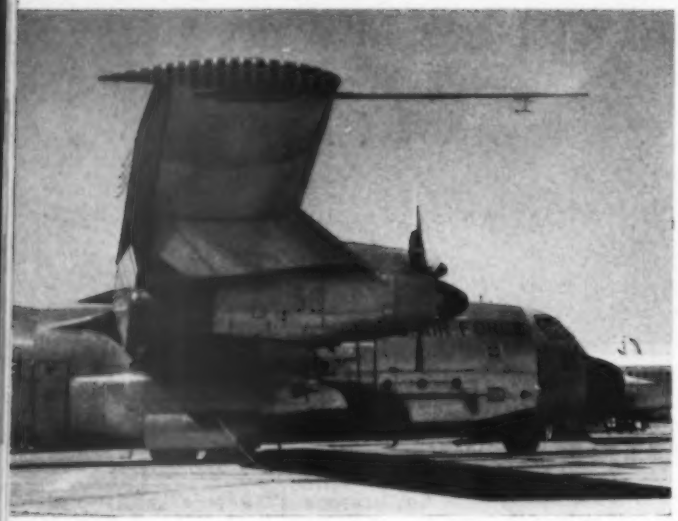
After parking near the main maintenance hangar we made our way past the assembled lines of aircraft, all of which were parked pointing into the wind instead of in the usual parallel line-up. We had arrived extra-early, so that the aircraft would not be obscured by throngs of people while we took the necessary photographs. As we had suspected, there were fewer machines on display—30 total, as against 35 last year. However, closer examination of some of the 30 proved very rewarding and, together with the large static display in the hangar, gave us the keynote of this year's show—propulsion.

In particular, the keynote was propulsion for high-speed flight. Among the testbed aircraft those of General Electric were supreme, for GE's flight centre is based at Edwards (as a photograph on page 381 of our March 18 issue confirms) and displayed four engine-research aircraft of singular interest. Largest was the Convair NB-58A being used to explore the flight performance of the J93 turbojet up to about M2.2 at over 60,000ft. The Hustler is excellent for such work, particularly since it was designed to carry a large pod beneath the fuselage. A single-shaft engine of light weight and moderate pressure ratio, the J93 is not now scheduled to employ high-energy reheat fuel, and has a sea-level static rating of some 30,000lb. The Hustler pod simulates the complete B-70 installation, but of the intricacies of geometry variation, accessory drives, bleed and dump systems, fire protection, control and instrumentation, one could only guess. Both ends were blanked off; the nozzle was about 20in below the skin of the rear fuselage and appeared to have an area roughly twice that of the aircraft's afterburning J79s.

Going from one extreme to another, the next GE test-bed was the Convair F-102A with the diminutive J85 slung underneath in a retractable pod simulating the McDonnell Quail. This engine is now in production, and was also shown installed in the Northrop T-38 and N-156F in the static display. The other two GE aircraft were built by Douglas. The smaller was the second XF4D-1 Skyray with a scale model of the CJ803-23 aft-fan engine pod, being promoted for use on the Caravelle, mounted under the starboard wing (picture last week). The other was the RB-66A powered by twin CJ805-23 aft-fan engines in very fat unstepped pods, simulating the installation for the Convair 990 (or 600). These pods looked huge compared with the "straight" CJ805 pods on a nearby Convair 880 (the third), and made us wonder about the ground clearance in crosswind landings. The 880 nacelles showed considerable signs of heat forward of the reverse-thrust cascades.

Leaving other powerplants for the time being, we soon found the USAF's three record breakers, the Lockheed F-104 (altitude), Convair F-106 (speed) and Kaman HU-1 Husky (helicopter altitude). The third North American F-107 stood by an F-104D with its cockpit open for inspection. A McDonnell F-101B two-seat intercepter stood alongside one of the ARDC T-33A hacks, which had a low-slung Cessna T-37A to its left. The Northrop T-38 and N-156F were parked side-by-side in their first public viewing together. The T-38 was the second machine and showed no signs of any modifications after having made nearly 100 test flights. The N-156F was also the second (94988) and looked very businesslike with Sidewinder wing-tip missiles, underwing 150 US gal tanks and a large centreline store. The cockpit canopy appeared to have been lowered and the interior looked extremely roomy even compared with that of the vast McDonnell F4H-1

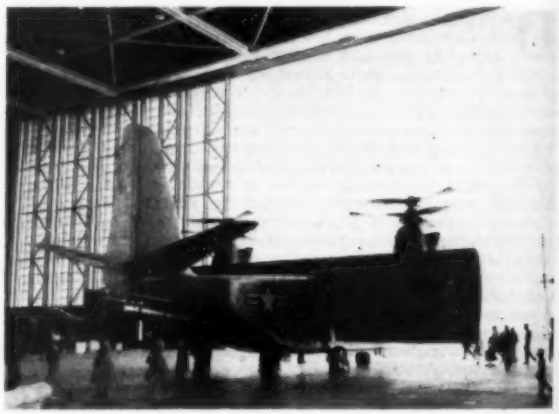
Most advanced turbojet installation in the Western World is the General Electric J93-GE-3 under development for the North American B-70 Valkyrie bomber. Operating on conventional hydrocarbon fuel this engine will drive the Valkyrie at more than 2,000 m.p.h. continuously for at least four hours. As noted in the text above this Convair NB-58A is being used to fly a complete Valkyrie powerplant



During demonstrations at Dobbins AFB recently this blown-flap Hercules came to a stop 450ft from touch down (four and a half times its own length). Eventually special Continental Model 356 engines will be installed in the pods, which at present house modified Allison T56s

—providing air for the flap-blowing. The flaps had a full 90° travel, together with drooping ailerons. Masses of wool tufts covered the port wing, aft fuselage and fin, causing a slightly nostalgic feeling for the old methods of observing airflow! Inside the hangar was the Hiller X-18, on show for the first time, with the wing tilted in the 90° up position. Painted on the fuselage were markings for every 10° increment of incidence and the rudder was fully tufted. A visitor from the US Army was a de Havilland Canada AC-1 Caribou in glossy olive finish, its fin and rudder looking disproportionately large. It was the only new piston-engined aircraft on show.

Before examining the rocket motors in the 4½-acre hangar, we checked with Information Officer Col Charles Brown, and his very capable staff. There we were introduced to Edwards' very first inhabitant—Mrs Corum Pelton, whose fitness at 72 years bore testimony to the healthy desert climate. She told us that the hangar stands on the site of her chicken house, built 50 years ago; and we couldn't help feeling the birds have changed somewhat! She went on to say that the original name of the base—Muroc—arose from the necessity of naming the post office they wished to establish there; her late husband hit on the idea of reversing the spelling of his name.



Shown with its wing in the 90° position was the Hiller X-18. Powered by Allison T40s, it started life as a Chase C-122

We then turned to the rocket motors on show, and saw the first full-size model of Boeing's SM-80 Minuteman ICBM, with four nozzles for its solid fuel first-stage rocket. Next, we were brought to a dead stop by the cavernous exit of the Rocketdyne F-1 engine. Approximately 10ft in diameter, the nozzle was of conventional con-di design, and a company spokesman said that it would be of the normal tubular construction. Also on view were the engines of the Thor, Atlas and Titan, and a working model of the Thor powerplant showed the ignition sequence. Many other displays in the hangar were concerned with the collection, collation and analysis of test data.

After lunch the flying display started at 1 p.m. Despite the fact that the wind was gusting up to 26 knots, only the helicopter demonstration, air-to-air "buddy" refuelling, and a cargo drop had to be cancelled on this account. An F-104B took off furiously and climbed to 40,000ft before planting a sonic boom on the base; then the other machines took off in a stream. The most memorable performances were given by an F-104 carrying out a series of aerobatics, a trio of T-38s in tight formation, and the F4H-1 showing its remarkable rate of roll. The NB-52A popped its 44ft drag chute on landing, and then proceeded to show off its remarkable crosswind landing gear, taxying past pointing 30° to the left. Other aircraft that flew by included the B-47, B-57, F-100, F-101, TF-102, F-106, F-86 and the C-130.

Some distance away to the east could be seen the test towers for the rocket engines and a small, but noisy, demonstration firing was made of a number of JATO bottles, together with a solid-fuel booster for the Mace missile. In summation, it became obvious that the number of aircraft at the test centre was decreasing rapidly, whilst the number of missiles and rockets was increasing. This made us a little unhappy as we feel that missiles make very poor display vehicles; but along with the 20,000 other visitors, we agreed that Edwards had once again put on an extremely interesting and well-managed display.

DESERT DISPLAY . . .

Phantom II standing alongside. The F4H was the 11th off the line, and carried three very large stores under the fuselage and inner wings. A peculiar reversed camber was noticeable on the horizontal stabilizer, which bore much evidence of heat from the twin J79s. This is perhaps the fastest and highest-flying combat aeroplane in the Western world.

Passing a Grumman F11F-1 with a very smug-looking tiger painted on its fin, and a countermeasures Douglas A3D-2Q, we stopped for a close look at the sleek and clean A3J Vigilante. This beautiful product of North American's Columbus division had a very slender nose, but in contrast to most M2 aircraft had an abundance of wing area, with large leading-edge flaps. The usual

Extremes in performance: an X-15 slung under its NB-52A, with Peter Bowers' Curtiss replica in the foreground

weapon-bay exit door at the rear of the fuselage had been modified from the original indented type, and a gap on each side showed evidence of purging of the bay by induced airflow.

At the western end of the display were a monstrous pair of Boeing B-52s. One was the old NB-52A 52-003, the first mother ship for the North American X-15, with its hypersonic charge slung under the right wing. The first X-15 (56-6670) was hooked up, whilst the second was shown on its landing gear. The NB-52 had small insignia painted indicating three captive flights and seven air-launches. Affording some contrast was the 1912 replica Curtiss pusher, built by Boeing flight-test engineer Peter Bowers. Later during the morning, Bowers made two extremely skilful flights, despite the very gusty cross-wind. The other B-52 was a new G-model, complete with a pair of GAM-77 Hound Dog missiles resplendent in a glistening white finish.

We then examined the Lockheed NC-130B Hercules with underslung podded engines—special T56 gas producers at present

Talking on Ice

NAPIER'S THIRD ANNUAL CONFERENCE

ON June 14, at Luton Airport, Beds, D. Napier & Son Ltd sponsored the third of their annual conferences on the protection of aircraft against icing. It was easily the most successful; the attendance was a record, and for the first time the Soviet Union sent an official delegation to a British meeting devoted to technical aeronautical problems.

Not only that, but two members of the Russian delegation—O. K. Trunov, assisted by M. S. Egorov, from the Aeroflot National Research Institute in Moscow—presented a most informative paper entitled *Results of Experimental Flights in Natural Icing Conditions, and Operation of Aircraft Thermal Ice Protection Systems*. In his introduction the author suggested that in recent years no accident to turbine transports had been directly caused by icing. Some 60 per cent of icing occurred below 10,000ft, and above 20,000ft icing frequency sharply decreased. With the Tu-104 possible duration of continuous icing never exceeded 30min. It was considered in the Soviet Union that it was well worth the extra flying time to seek out all the icing conditions required without trying to simulate them; flying time on the Tu-104 programme amounted to about 60hr. A specially equipped Il-12 was used to seek out suitable conditions and evaluate icing factors accurately. Before such tests, however, it was desirable to evaluate the thermal performance of the aircraft system in a clear sky (i.e. dry air). The paper described in some detail the instrumentation employed by the National Research Institute on general icing investigations, and went on to examine the effects of icing on aircraft aerodynamic characteristics and performance.

Numerous curves were given showing C_L/C_D polars for various types of icing. One set of curves showed the behaviour of an Il-14 with various degrees of icing, in relation to available power on either one or two engines. This led to curves showing rate of climb and service ceiling and finally to maximum rate of climb during a balked landing. Even with the ice-protection system operating the performance was adversely affected, and when starting an overshoot with flaps at 45° the aircraft continued to sink an additional 100ft, and the distance required to reach 165ft altitude increased by 1,640ft. A particularly interesting set of curves showed the variation in level speeds of a number of transports for ice thicknesses from zero up to around 40mm, while cruising at heights from 6,500 to 13,100ft at constant power and with protection systems switched off. Expressed as a percentage of the un-iced speed, the speeds for 30mm-thick icing were: Il-18, 93; Tu-104, 92; Li-2 (Dakota), 87; and Il-14, 77.

After covering a great deal of ground in the theoretical and practical operation of aircraft ice-protection systems, the author concluded his paper with brief descriptions of the ice-protection systems employed on the Tu-104 and Il-18. In general, he said, jet aircraft should have bleed-air on the wings and electrical systems elsewhere.

In the Tu-104, for example, the wings were protected by bleeding air from the 8th compressor stage of both engines. The foremost 15 per cent chord had a double wall, between which the hot air flowed in a chordwise fashion to exhaust at the tips. It was particularly important on swept wings that heat intensity should increase towards the tips. The engine intakes and parts protruding into the air passages were heated by 7th-stage air, and the compressor entry guide vanes by 5th-stage air. Tests had shown that the original intake and engine protection was inadequate, and compressor intake damage had occurred. Accordingly the bleed airflow was increased, distribution improved and surface heating intensified. All these bleed systems employed pneumatic valves.

Empennage leading edges were all of sandwich structure back to about 7 per cent chord, consisting of metal skins with an interleaved electric grid heated cyclicly from the aircraft 27V system. Each of the three sections on each surface was switched on for 40sec and off for 80sec and was protected by bimetallic circuit breakers. In spite of some thermal lag the design had proved itself reliable, and capable of withstanding rain and hail. Windscreen panels comprised two layers of silicate glass with a conducting film between them loaded at 0.6W/sq cm.

All portions of the Il-18 were protected electrically, with the exception of the powerplants and their intakes, which were heated by air bled from the final (10th) compressor stage. The airframe leading edges were sandwiches similar to those of the Tu-104 tail, the heated surface extending back to 10 per cent chord on the wing and 7 to 8 per cent on the empennage. Each wing and tail section was divided into four sections, the "on" and "off" times being 30 and 120sec and the heat loading varying from 1 to 1.4W/sq cm. The propellers were protected over 60 per cent of radius and 17 per cent of blade chord; each section was "on" for 24sec and "off" for 24sec, the intensity varying only with radius from 1.5 to 2W/sq cm.

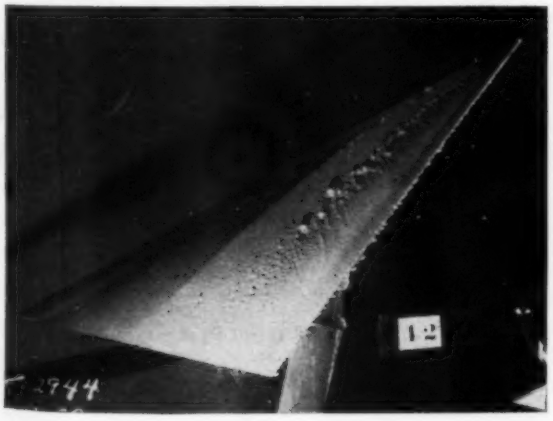
The illustration at the foot of column one is from *Icing Problems of High Speed Aircraft*, by C. K. Rush of the National Research Council in Ottawa. In this connection, predominant features of high-speed aircraft were the high cruising altitude and the high speed during the climb and cruise. These led respectively to a number of meteorological and thermodynamic aspects, which the author examined in detail. It was felt that, over most of the airframe, accretions up to 3in thick could be allowed. Of particular interest were aircraft having leading-edge separation, such as the slender delta with vortex sheets originating at the sharp leading edges. Behaviour of such a wing (see picture) includes formation of ice over the upper surface on all angles of attack (and especially at high angles), increased rate of formation along the paths of the vortices, and a heavy growth on sharp edges.

Although not particularly lengthy, *The Icing Research Aircraft*, by B. T. Cheverton of Napier, covered a wide range of topics, and in particular outlined the operation of a general-purpose testbed of maximum flexibility, such as Napier's Lincoln (in the background of the photograph above). This proved the hot-gas protection system for the Beverley, followed by work on the Comet, Caravelle, Britannia, Avro 748 (pulsating boot) and Argosy tailplane (Napier Spraymat). The Lincoln was now being converted to carry an NA.39 tailplane section.

Both the meteorologist's viewpoint and much of essential interest to aircraft designers was contained in *Clouds and Aircraft Icing*, by R. F. Jones of the UK Meteorological Office. His major topics were cloud formation, clouds (S. England) giving rise to icing, the occurrence of supercooled water in clouds and its forecasting, and the statistics of aircraft icing. Ground problems of the short-haul operator were succinctly put by B. Briggs and G. Hinton-Lever of BEA. They discussed the de-icing and anti-icing of aircraft prior to starting engines, and protection up to the point at which power was first reduced following take-off.

The Russian delegation, with their hosts, at Luton. From the left: M. S. Egorov; O. K. Trunov; Russian interpreter; B. T. Cheverton (Napier); C. L. Cowdrey (Napier, conference president); V. Alinov; and B. Bujanov

Sharp-edged delta in the 4ft 6in tunnel of the NRC, Ottawa



CUSHIONCRAFT

A new vehicle

by Britten-Norman

AT Bembridge Airport, Isle of Wight, Britten-Norman Ltd are now beginning trials of their new "Cushioncraft"—their name for an air-cushion vehicle built for Elders and Fyffes. It will be used to study the potential of this type of vehicle for the carriage of bananas from plantations in the Southern Cameroons.

Together with its associated company, Crop Culture (Aerial) Ltd, Britten-Norman have studied the potential for the Cushioncraft in many different countries. These investigations, they say, have revealed the possibility of a break-through in transportation techniques by the use of air cushion vehicles which could accelerate the pace of development in territories where roads are non-existent and costly to build and rivers are seasonally unnavigable.

The Cushioncraft is circular in form and measures 18ft 10in in diameter. Empty weight is about a ton. A driver and two passengers are carried in a cab mounted on the deck, where there is also space for some cargo. Designed operating height above water or ground is some 12-15in.

The engine is a Coventry Climax giving up to 170 b.h.p. This drives a large rotor, running round the circumference of the vehicle, and twin, rear-mounted propellers. The peripheral rotor supplies air to a single jet nozzle around the bottom edge of the craft to maintain the air cushion. The peripheral rotor, it is claimed, reduces losses by keeping the length of ducting to a minimum.

The rotor is driven mechanically by a friction wheel at the rear of the craft and has 40 aerofoil blades fixed radially to an inner and an outer shroud ring, the whole assembly being maintained in place by a series of rollers. The compressor is mounted in a short vertical duct which, below the rotor, curves inwards so that the air is directed towards the centre. The duct is 10in wide at the efflux and the resulting "thick" jet is claimed to help to stabilize the craft when riding on the air cushion. The rotor is of laminated wood construction, covered by plastic sheeting. The blades and stator blades are of laminated wood with doped-fabric covering.

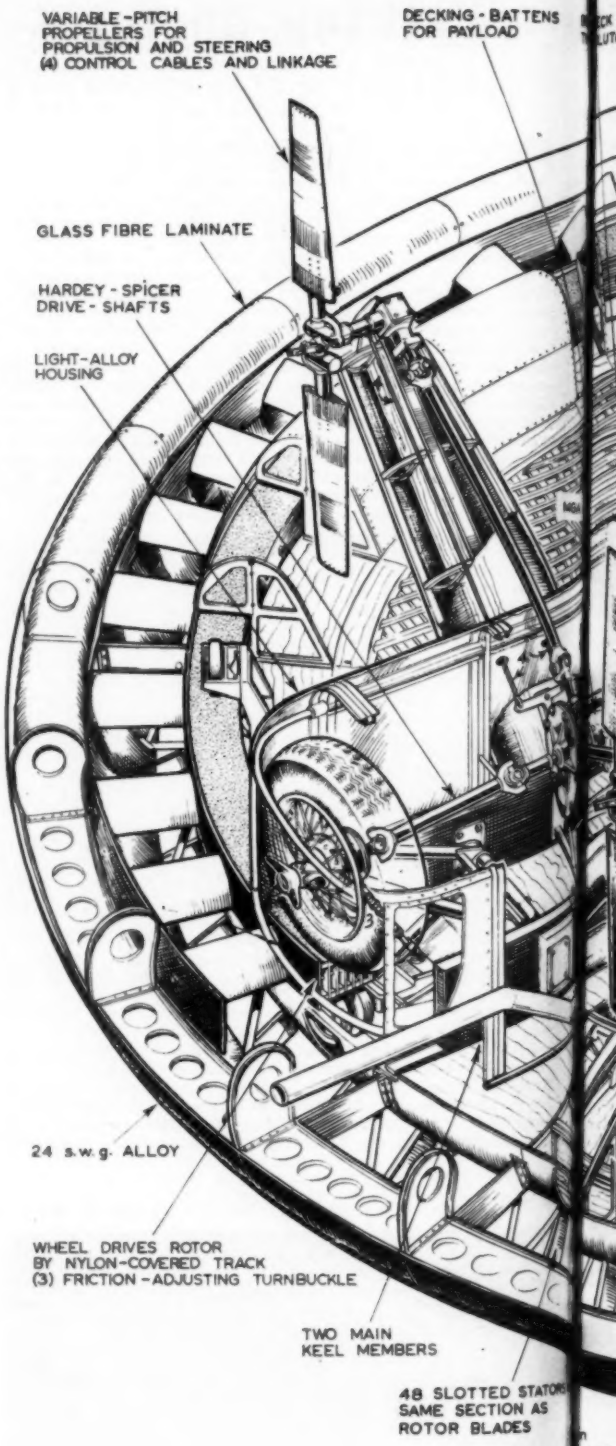
As already mentioned, the engine also drives two propellers. These are, in fact, Hiller helicopter tail rotors. They are mounted above the deck at the rear to provide the Cushioncraft's horizontal propulsion. Pitch may be varied collectively to provide ahead or astern propulsion, or differentially for steering.

The driver has two separate controls: a combined hand throttle and clutch to engage the compressor and control ground clearance, and a steering wheel which can be pulled backwards and forwards from the control panel, or can be turned. To move forwards the driver pushes the wheel in, and to reverse he pulls it back. To move left or right he turns it in the same manner as a car steering wheel.

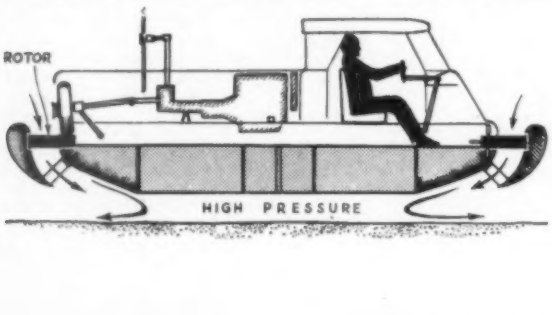
Two fuel tanks, each of 15gal capacity, give a 6hr endurance.

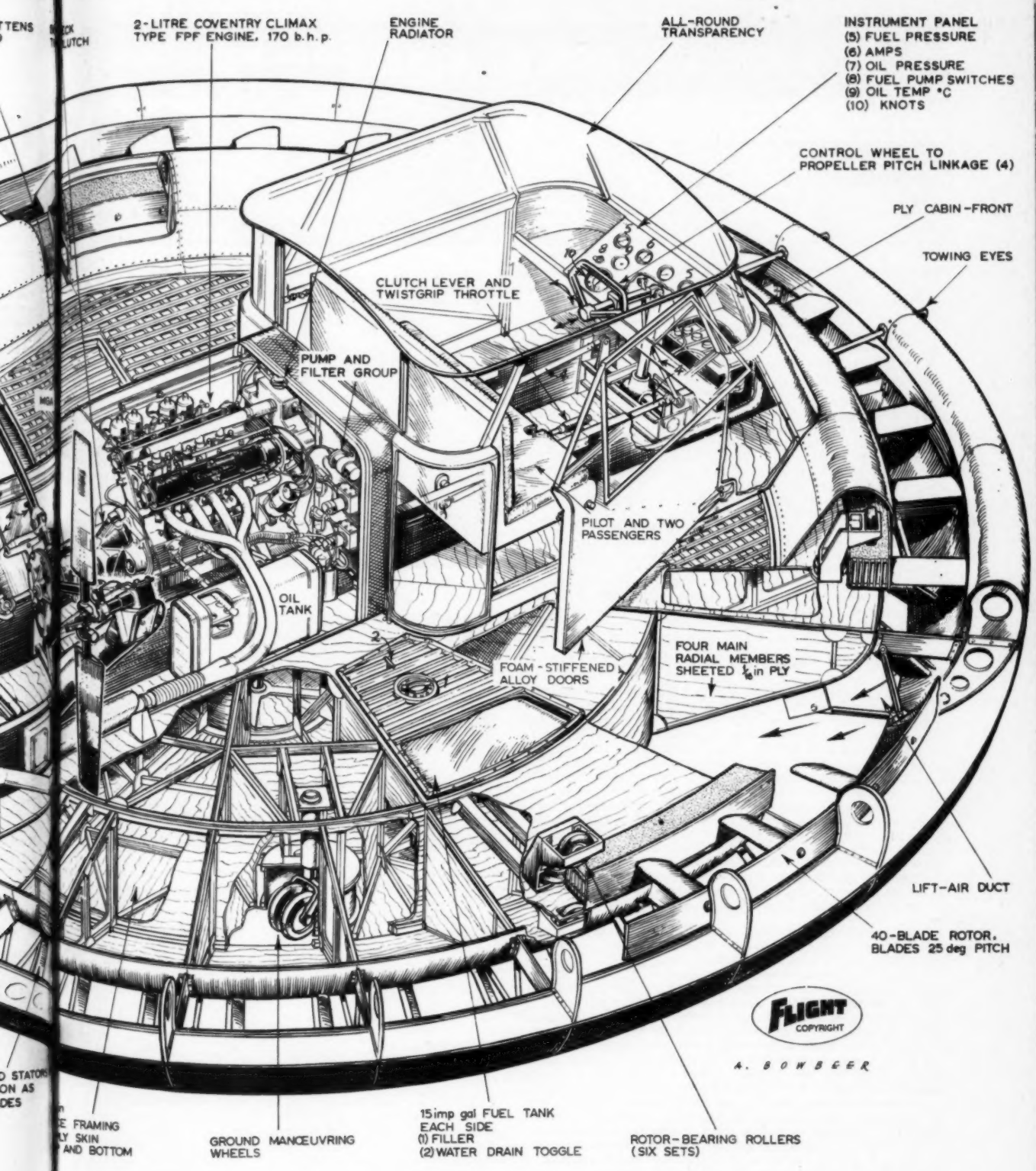
Three twin-bogie wheels are fitted beneath the craft to enable it to be handled on the ground when the engine is not running. These wheels can be jacked up and down to provide sufficient ground clearance for servicing.

Concerning the optimum size for a commercial Cushioncraft the makers state: "When we began seriously to consider developing a Cushioncraft a study was made of the factors affecting the load and capacity desirable for a prototype machine that would


VARIABLE-PITCH PROPELLERS FOR PROPULSION AND STEERING
(4) CONTROL CABLES AND LINKAGE
DECKING - BATTENS FOR PAYLOAD
GLASS FIBRE LAMINATE
HARDEY - SPICER DRIVE - SHAFTS
LIGHT-ALLOY HOUSING
24 s.w.g. ALLOY
WHEEL DRIVES ROTOR BY NYLON-COVERED TRACK
(3) FRICTION - ADJUSTING TURNBUCKLE
TWO MAIN KEEL MEMBERS
48 SLOTTED STATOR
SAME SECTION AS
ROTOR BLADES

Showing the Cushioncraft's inboard profile and pressure distribution





The prototype Cushioncraft is basically a shallow wooden "pillbox" with 24 spokes and birch-ply sheeting. Inner and outer lips of the air duct are added at the periphery and a pair of heavy keel members mounted above the basic hull provide a foundation for the engine, gearbox, friction-wheel assembly and crew seat. The annular fan is carried in six nests of rollers which restrain it above, below and on the inner face. Payload (bananas) will be lashed to the battens of the decking on either side of the central housing. The crew have excellent all-round visibility. A picture of a cushioncraft airborne appears in our "From All Quarters" pages

CUSHIONCRAFT . . .

in production form immediately command a useful market. The main point that emerged from discussion with potential users was that, provided the vehicle cost less than about £10,000, interested industrial companies and corporations would be prepared to buy immediately to gain field experience with vehicles using the air cushion principle. Armed with this experience potential users could specify the optimum machine for their particular transport requirements. £10,000 or less spent on a route assessment vehicle would probably be saved on subsequent larger machines because the precise capacity and speed requirements dictated by the routes and loads concerned could be accurately established.

"It became clear that few potential purchasers would be prepared to lay out very large sums on Cushioncraft until more was known about their performance limitations over different kinds of territories. A study of manufacturing costs of different types of transport vehicles showed the following:—

Type of vehicle	Approx cost per lb empty weight
Modern airliner	£10
Executive twin aircraft	£5
Light aircraft	£2
Yacht (excluding ballast)	£1
Motor transport	10s to £1

"Design studies showed that reasonably powered Cushioncraft in the smaller sizes could be expected to lift approximately their empty weight to clearance heights of about one foot and up to twice their empty weight to smaller clearance heights which would still permit them to run over semi-prepared ground. This applied over water as well as over land. These studies also showed that there is a lower practical limit to size since when the cushion area of the machine is very small the power required to maintain the air cushion increases considerably.

"After consideration of these factors it was decided that a Cushioncraft of about one ton empty weight and cushion area of approximately 200 sq ft represented the minimum practical size which could be expected to satisfy the commercial desiderata noted above. The cost per pound of basic weight of such a machine in production is not expected to exceed that of simple light aircraft and could in large production approximate that of motor transport vehicles."

ABOUT BRITTEN-NORMAN

THE company which has now produced the Cushioncraft started in 1949 as a spare-time partnership to design and build a light single-seat aircraft called the BN1F. This was completed and flown in six months from freezing the design. The first example, powered by a 36 h.p. Aeronca Jap, was damaged in an accident caused by engine failure, and a revised version was built with increased span and powered by a 55 h.p. Lycoming.

It was apparent that more profitable outlets existed in the conversion and sale of Tiger Moths for top-dressing in New Zealand. A number of these conversions were, in fact, sold, and the partnership then turned its attention to the design of equipment for aerial spraying. The resulting spray gear—the Micronair rotary atomizer—was designed to replace the conventional boom-and-nozzle equipment by obviating the more serious deficiencies of this type of aircraft for aerial work. The Micronair is now in world-wide service and production continues. Sales to date exceed 200 aircraft sets.

An associate company of Britten-Norman, Crop Culture (Aerial), was originally formed as a partnership to exploit the possibilities for more economic aerial spraying offered by the Micronair equipment. Operations began in the Sudan, where cotton was treated by two Tiger Moths. The following year the fleet was increased to five aircraft and the company became a limited liability company. Since that time other aerial spraying companies have been formed, either as wholly owned subsidiaries or partly owned associated companies of the parent company. The group's fleet of spraying aircraft now totals 58, made up as follows: Crop Culture (Aerial) Ltd, 13 Tiger Moths and 2 Austers, operating in the United Kingdom; Crop Culture (Overseas) Ltd, 5 Austers operating in West Africa, 2 Pipers and 1 Auster operating in Jamaica; Crop Culture (Sudan) Ltd, aircraft supplied to Sudan by CC(A) on seasonal hire basis; Microfumar, 5 Stearman and 7 Pipers operating in Colombia, South America; Microfan, 3 Pipers operating in Colombia; Aeroatomizaciones Ecuatorianas, 12 Pipers operating in Ecuador; Agropan, 2 Stearman and 1 Snow operating in Panama; Agricultural Aviation Pty, 5 Tiger Moths operating in Australia.

In addition to the foregoing, Crop Culture operates a light aircraft at Bembridge and a twin-engined executive aeroplane in West Africa for Elders and Fyffes Ltd. Crop Culture also has a holding, through its associated company Agricultural Aviation Pty Ltd, in Australian Aeronautics Pty Ltd, a company engaged in the repair and maintenance of aircraft. Finally, Crop Culture owns 80 per cent of Air Stock West Africa Ltd, a company which represents British and American aircraft and aviation equipment manufacturers in Ghana, Gambia, Sierra Leone, Nigeria and the Cameroons.

All of which augurs well for the Cushioncraft.

The house flag of a shipping line (Elders and Fyffes) goes curiously with twin screws in the air and—apparently—with a spare wheel

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RAF "AT HOMES"

THIS is the twentieth anniversary of Battle of Britain year, and 25 RAF stations in the UK are being opened to the public on September 17, the Saturday in Battle of Britain Week (September 12 to 18). Listed under counties and countries, the stations "at home" are as follows:—

Buckinghamshire: Halton; *Cambridgeshire:* Waterbeach; *Devonshire:* Chivenor; *Hertfordshire:* Bassingbourn; *I.o.M:* Jurby; *Kent:* Biggin Hill; *Lincolnshire:* Waddington; *Norfolk:* Coltishall; *Northern Ireland:* Aldergrove; *Northumberland:* Acklington; *Oxfordshire:* Benson; *Rutland:* Cottesmore; *Scotland:* Kinloss and Leuchars; *Shropshire:* Cosford and Shawbury; *Suffolk:* Wattisham; *Sussex:* Tangmere; *Wales:* Valley and St Athan; *Warwickshire:* Gaydon; *Wiltshire:* Colerne; *Yorkshire:* Finningley, Leconfield and Norton.

Straight and Level

THE managing director of Overseas Aviation, Bernard Dromgoole, waxes vituperative about the British Independent Air Transport Association. You can read all about it on page 882.

This is the first time, so far as I know, that BIATA, the embodiment of Britain's private-enterprise air transport spirit, has been attacked in public. Mr Dromgoole says it is "exclusive" and adds, in effect, that it doesn't represent the independents any more.

This is rather an interesting development. It isn't a rebellion, because Overseas have never been members of BIATA (who won't have them). But it emphasizes that there are now two kinds of independent, BIATA and non-BIATA. The non-members, 11 in all, are the ambitious new boys who feel that they stand for what the BIATAs *used* to stand for. They consider that some of the older independents have sold their souls to the Establishment, not to mention the shipping business.

* * *

Well, that may be putting it a bit strongly. But British United and Eagle are now, as they say, snuggled up closely to the State corporations. As a result of Mr Sandys' matchmaking, they can be expected to turn over when BOAC and BEA turn over. The rebels, whose constant needling kept the corporations on their toes, are now part of the Establishment.

Where now lies the true soul of British private enterprise air transport? In BIATA or among the non-members? If it is to remain in BIATA—indeed, if that Association's ethos is to survive at all—it mustn't allow itself to become vulnerable to charges of being exclusive.

Environmental test, British style. Were this an American missile, the test concerned—which is to prove Seaslug's impermeability to driving rain—would be in a specially built million-dollar test facility with a name like TWERPS (Test Water Environmental Rain Proofing System). We British just hoist the thing up with a crane borrowed from the plant department, call out the works fire brigade, and let them have a jolly good squirt

● This is what Capt A. P. Yakimov, Aeroflot Tu-114 skipper, thinks about the Boeing 707:—"American designers, in their chase after the maximum number of passenger seats, cramped the cockpit to a great degree. The cockpits are narrow, stuffy and difficult to turn around in. When the American pilot got up from his seat during the Boeing 707 training flight, his shirt was wet with perspiration. I, too, was very hot. Out of habit I wanted to turn on the fan, as I would have done on the Tu-114. But there was none on this plane. It is hard to explain why American pilots are denied the most elementary conveniences in flight."

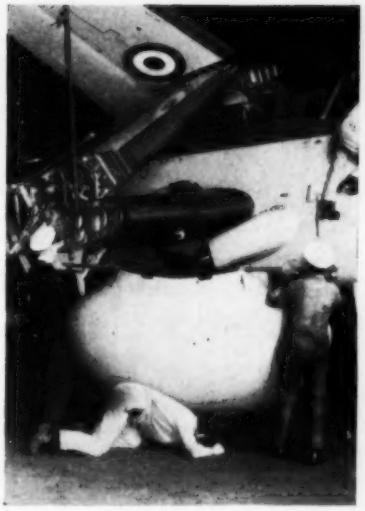
● Something that's needed saying for a long time—from the pen of BEA's flight operations director, J. W. G. James, writing in the corporation's flying staff magazine *Intercom:* "The international situation in respect of pilot-management relationships isn't very propitious for a settled future, with strikes being the order of the day. We haven't come to that, thank goodness, and as one of the airlines which have not suffered in this way, perhaps it is for us to set an international lead away from the strike solution concept, recognizing as mature people that strikes can be no part of the doctrine of a group portraying itself as a highly qualified, responsible profession."

● The other day a *Flight* colleague flew in a BOAC 707 to New York. He was enormously impressed with how hard and how fast the cabin staff worked. Up and down the aisle went those girls, to and from the galleys, serving a seven-course luncheon to more passengers than had ever before sat in a BOAC aeroplane. Galley slaves, they called themselves.

Slightly disconcerting, occasionally most disconcerting, was the thud thud thud of these tramping feet (notwithstanding the daintiness of their owners) transmitted to his chair through the floor of this otherwise tremorless aeroplane.

So, since girls with foam-rubber legs are hard to come by, why not foam-rubber aisle undercarpeting?

No other complaints—not one.



Now lads, when that photographer chap from "The Flight" comes round I want you all to look to it. Don't overdo it, mind, and try to look natural. You all know your jobs, chaps, so get cracking. Oh, by the way, petty officer. Make sure that Flag Officer's bath is properly drained and replenished, would you?

● "If the jet aeroplane is full it's making reasonable profits," says Peter Masefield on BBC Television. "But if it's empty, you can't throw five-pound notes out of the window fast enough to pay for the losses."

● Duncan Sandys, Minister of Aviation, must be heartily sick of all the puns that have been made on his name. I will risk his further groans by quoting the following from *The Log*, journal of the British Air Line Pilots Association. [Hon Readers: O-o-o-h!]:—

"He [the Minister of Aviation] is placing himself in direct control of almost every aspect of the aviation industry: specifications, orders, purchases, operating, safety, licensing, accident investigation, the lot. Mr Sandys may well be competent to cope with all this, but what of his successor? If the whole structure of aviation is built upon Sandys, when he shifts we may find ourselves on the rocks."

Aerius, the pilot writing this, is worried about the "already absurd restriction on free speech in aviation," and warns that the trend is towards an industry in which "criticism will be stifled altogether."

He is right, of course. There are now very few sections of the aviation business that are not dead scared of offending the Ministry. Anyway, there's always. . . .

ROGER BACON

loaded Comet 4B is about 35kt at breakaway, dropping slightly after the initial roll. Blast while taxying in, being normally a function of landing weight, drops to less than 25kt at the same distance. These figures assume nil surface wind, a smooth, level apron, and the use of the minimum power required for the manœuvre.

Factors other than weight must also be taken into account when an estimate is made of the blast likely to result from a given aircraft. As an example, the effects of engine installation can easily be shown by a comparison of the Comet 4B with the Caravelle. Present gross weights for these two aircraft are 158,000lb and 95,800lb respectively, yet there is only a small difference in the resultant blast; the gentler performer on the apron is in fact the Comet.

It will be realized that if breakaway thrust required is 3 per cent of weight, this thrust is the total produced by all engines. The number of engines available therefore requires each Avon in the Caravelle to produce some 250lb more thrust than does each Comet Avon. The rear position of the Sud aircraft's engines further increases the blast velocity at a given distance behind the

Apron Planning for the Jets

FACING THE BLAST PROBLEM: WHAT PRACTICAL TESTS SUGGEST

By R. A. TWOMEY*

AIRPORT apron development the world over is being bedevilled by jet blast. We read of tunnels, mobile lounges, towing and blast screening, all proposed as solutions to a supposedly enormous problem, but all of them enormously expensive solutions! Is blast a big problem, or is it a bogy?

With the jet re-equipment programmes of long- and short-haul airlines now well advanced, it becomes essential to answer this question. For jet blast is undoubtedly causing some airport administrations planning difficulties, and a glance at the 1959 issue of IATA's *Airport Buildings and Aprons*† will show that apron layout has become a complicated matter. However, some national administrations and airlines have done a good deal of research, practical or theoretical, into the blast characteristics of present and projected aircraft; and in spite of the many variables in the equation a fair estimate is possible of the size of the problem, with the result that we may expect to reach reasonable decisions on the best way to lay out and use our aprons.

Basic "Blastics" The speed and extent of jet blast depend on a number of factors: aircraft weight; the number, type and grouping of engines; apron surface and slope; ambient wind; radius of turn; and taxying technique. One of the most important parameters is the operating weight, which is the chief cause of the greater blast of a Boeing 707 in comparison with a Comet. The average thrust needed for "breakaway" (the initial roll from standstill) is about 3 per cent of weight, and the average for taxying 2 per cent of weight. It has also been found that a simple square root law governs the relationship between thrust and blast velocity.

As a result, the blast speed 150ft behind the jetpipes of a fully

†*Reviewed in "Flight" for October 23, 1959.*

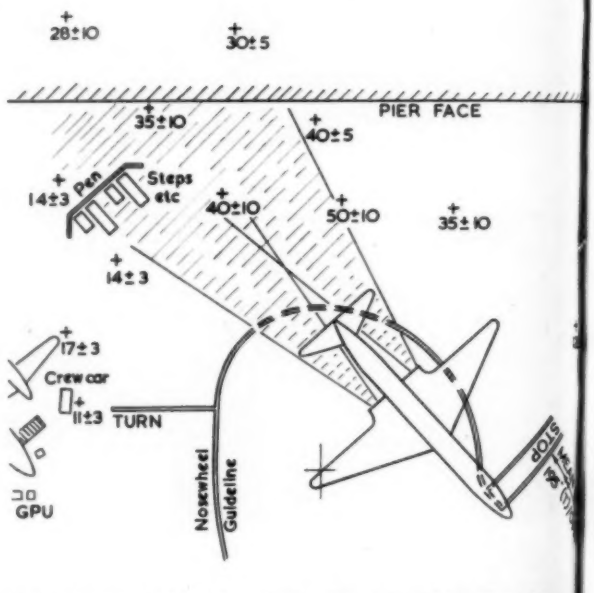


Fig 1a. Comet ground handling trials: blast speeds (including effect of surface wind) during taxi-out. Averages and ranges in knots

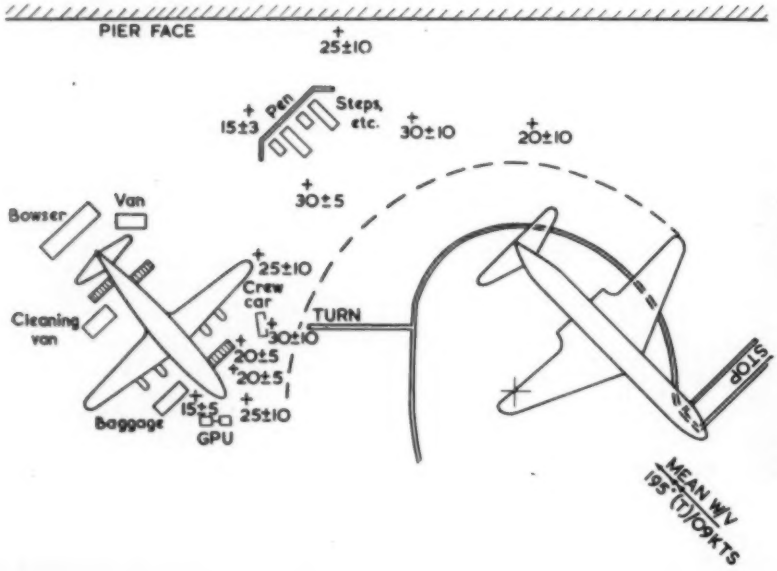


Fig 1b (left). Comet blast speeds during taxi-in. Conditions as in Fig 1a

*The author of this article is a member of the BEA flight operations department, but the opinions he expresses are personal ones.

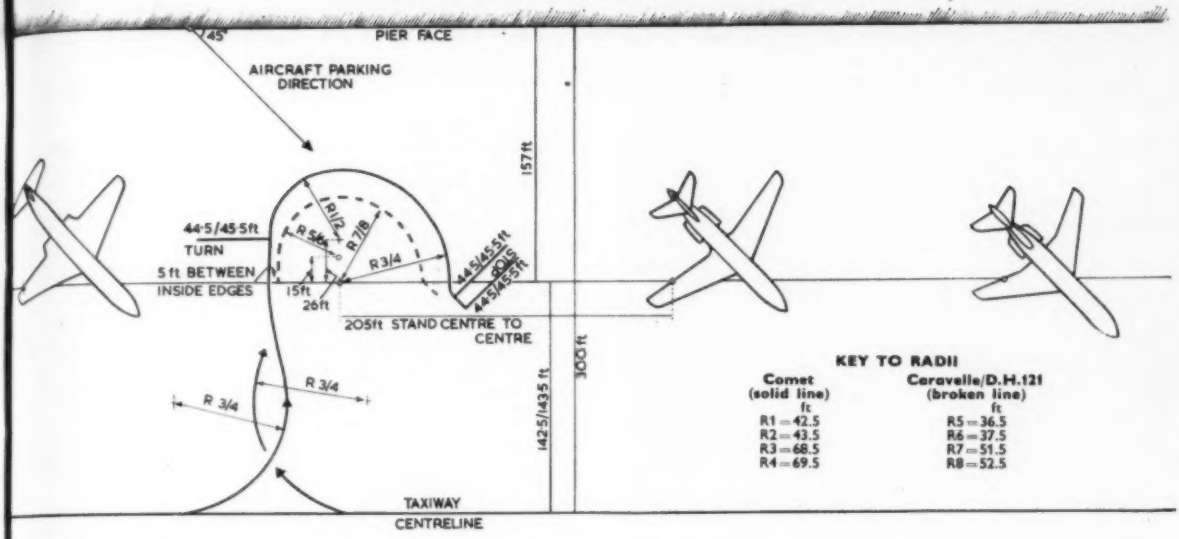


Fig 2. Possible apron layout for Comet 4B, Caravelle, D.H.121, etc., based on a 45° nose-out parking angle. The Caravelle guideline, as recommended by Air France, could also be used by the D.H.121. Scale thickness of guidelines has been slightly exaggerated for reproduction purposes

manœuvring axis, which is the axis of the mainwheels. On the other hand, when allowance is made for jet core intermingling, which is greater in the case of the Comet, the score is again almost even.

From consideration of these points it is not surprising to find that the shutting down of any engines during ground manœuvring, or the use of asymmetric thrust, is bound to result in the generation of unnecessary extra blast.

Experiments to test the effects of apron slope on breakaway blast show that this factor is also important. For example, during trials carried out by BEA, when a Comet 4B was made to breakaway both up and down a slope of 1 : 150, it was found that the uphill case required 1½ times the thrust needed in the downhill case. However, a downhill slope for departures is an uphill slope for arrivals, so that the useful application of this factor is rather limited. There are also other reasons for requiring aprons to be as level as is consistent with adequate rainwater drainage.

The effect of surface wind is considerable, and the aircraft's blast field can be considerably displaced by cross-winds. As far as head- or tail-winds are concerned a reasonably accurate answer results from the linear addition or subtraction of such a component.

Since it is the power applied by the pilot that directly affects the amount of blast produced, his taxying technique is of the utmost importance. The gentlest breakaway will be achieved by centralizing the nosewheel, setting up a pre-calculated minimum adequate power, and waiting for the aircraft to roll. As far as the taxi-in to the stand is concerned, it has been found that with practice good use can be made of momentum; in this respect a well laid out apron is of the greatest assistance to both pilot and marshaller.

Acceptable Blast Must we fence each aircraft around with expensive blast-screens? Or, again, must we accept towing with all its delays and operational complications? Let us hope not, for the burdens of such solutions would fall heavily on airlines and administrations alike. What blast levels, then, are acceptable?

Over a year ago the (then) MTCA carried out a most interesting trial with test "passengers" who were subjected to the blast of a Comet at varying speeds. When the velocity exceeded 25kt many showed signs of distinct discomfort, in spite of the fact that these same people thought nothing of walking home in a much stronger "natural" wind. The psychological effect of standing behind a large aeroplane, in the unfamiliar environment of a warm, paraffin-laden breeze, made all the difference.

Any airline wishing to learn from this test would therefore exercise the most watchful care to ensure that its passengers never met such conditions. This would be particularly easy to achieve with a pier system, where outdoor walking distances are low, and where all passenger movement during boarding or disembarking can be controlled from pier gate or aircraft door.

Apron personnel can be expected to accept higher speeds than passengers, and it would appear that 45kt can be withstood without difficulty. The items of equipment used on the apron have differing blast limits, varying from servicing steps at the lower end of the scale to bowsers and ground-power units at the top. However, it has been found quite a simple matter to anchor the lighter pieces of equipment, while the heavier items cause no problems and may even provide some localized shelter. Small blast screens near the pier, in the "dead area" between adjoining stands (the area which is not overlapped by the wing-tips of arriving or departing aircraft) would answer any remaining requirement for shelter, without having any effect on stand dimensions.

It would not be necessary to apply a blast limit to terminal buildings or piers, since any building should be able to stand a wind of gale force.

The maximum blast speed which can safely be withstood by a parked aircraft of Viscount size appears to be at least 55kt. In practice such a figure will rarely be experienced and it is likely that the critical factor in deciding stand dimensions will be wingtip clearance and not the blast limit.

Conclusions For many reasons, which are outside the scope of this article, the most efficient apron layout for the short-haul operator is the pier system. There is now considerable evidence to show that with such a layout jet aircraft can and should be manœuvred close up to the pier under their own power, provided appropriate precautions are taken. In fact, if both apron occupancy and costs are to be kept to a minimum it is suggested that towing must have no part in an operational turnround. If the requirement for more concrete on the apron is also to be minimized the large "three sides of a box" type of blast screen is similarly unacceptable, since it will affect wing-tip clearances and call for a subsequent increase in stand size. This is quite apart from the cost of the screens themselves.

The precautions to be observed should cover both planning and operational use of the apron, as well as engine handling technique. They can be subdivided into:—

(a) Safeguarding the adjoining "downstream" stand at breakaway by parking aircraft at a nose-out angle of at least 45°. This will allow breakaway blast to impinge on the building rather than on another aircraft, and will also allow the "live" aircraft's departure roll to be in a straight line (with resultant reduction in thrust required).

(b) Ensuring that stand dimensions are based on a practical operational turning circle with the maximum of visual guidance, a reasonable clearance (25ft) between the outer wingtip of the moving aircraft and other aircraft and obstructions, and the acceptable blast limits of the downstream parked aircraft. For the Comet 4B all these requirements are satisfied by a stand centre-to-centre distance of 205ft. Estimates suggest a rather lower figure for the D.H.121, but much depends on the parking angle involved and the requirements of other types of aircraft on adjoining stands.

(c) Safeguarding of passengers, apron personnel and equipment by the application of carefully developed procedures based on acceptable limits of blast velocity. Although such procedures may involve a temporary curtailment of some turnround activity when a jet taxies into an adjoining upstream stand this solution is far more acceptable than other proposed solutions.

(d) Making use of taxying techniques designed to keep blast velocities to a minimum: when taxying out, by using a minimum pre-calculated power symmetrically on all engines and then waiting for the aircraft to roll rather than applying a burst of high power; when taxying in, by avoiding sharp turns, making maximum use of momentum during the final turn on to the stand, and once again by using symmetrical power on all engines. This type of taxying technique is in use by BEA's Comet pilots.

"Open Skies" for Air Transport

WHAT IS THE PRICE OF TRAFFIC RIGHTS?

By T. B. HURLD

THE Anglo-American discussions on the Bermuda air agreement have foundered. This prompts the suggestion that we explore an idea now being discussed by advanced study groups on both sides of the Atlantic.

Very briefly, the two governments concerned in negotiating any bilateral agreement of the future would focus their attention on two principal matters: (a) The designation of agreed ports-of-call in their own territories; and (b) charges made by one government upon the other for the right to set down and pick up traffic at the agreed ports-of-call, irrespective of origin or ultimate destination.

Pick-up or destination points in other territories would not be specified and would be of importance only in relation to the general principles of the agreement—for example, those provisions governing capacity. Subject to the general principles of any such agreement, the designated carriers of each government would be free to carry as much traffic as they liked via the designated ports-of-call—in exchange for cash payments by one government to the other.

No extra costs for the passenger. No extra for the airlines. No crazy limitations on Fifth Freedom traffic. No more long wrangles in sunny islands by government officials. No more academic arguments about liberalizing international air transport. No?

Why not? History may show that the definition and exchange of the ironically named "Five Freedoms of the Air" was the biggest obstacle to progress in the post-war period.

Unless simplifications *can* be achieved there is a grave possibility that air transport of the future will be strangled by artificial restrictions which can be compared only with the drink licensing laws for theoretical rectitude and practical stupidity. Like all good ideas, this one is not really new and it will take some time before the basic idea has passed the point of inevitability and reaches the point of grudging official consideration.

The Bow Group, in their *Wings Over Westminster*, reminded us of Henri Bouché's idea that Fifth Freedom rights could be "sold" as between governments. Dr Bin Cheng, in a recent address to the British branch of the International Law Association, pointed out that speedy progress could be made if only governments could agree to abandon the controversial route-schedules in their bilateral agreements—of which there must by now be well over 500 in existence.

Of course, the complete abandonment of route-agreements would by itself lead to the pre-war Utopias of complete freedom of the skies—which were a vision of all aeronautical liberals. That is now impossible. But we *can* substitute a form of agreement which is at once liberal and amenable to flexible control. The way this could happen is best seen by means of an example in outline:—

UK-USA Example (Scheduled Services)

(1) The governments can preserve the existing statements of principles governing capacity and the provision of Fifth Freedom traffic; they can preserve the exchange of agreed statistics and regular *ex post facto* review and consultations.

(2) The "route" agreements would merely contain schedules in the following form:—

A. Ports-of-call in UK territory for USA-designated carriers: London, Manchester, Glasgow, Bristol, Hong Kong, etc.

B. Ports-of-call in US territory for UK-designated carriers: New York, Chicago, Boston, Honolulu, etc.

(3) The governments would at the same time agree "foreign traffic credits," payable solely as inter-governmental transactions in respect of each passenger (or ton of cargo) set down or picked up by their respective carriers in each other's territory. (For example, credit payable by UK to US for each passenger (or ton of cargo) set down or picked up by a UK carrier at a US port-of-call—$2. Credit payable by US to UK for each passenger (or ton of cargo) set down or picked up by a US carrier at a UK port-of-call—$1.)

Notes

(a) There is no need for the rates of these foreign traffic credits to be disclosed in the text of the agreement. (For example, they could be at equal rates for each government.)

(b) The foreign traffic credits may be reviewed from time to time in the light of traffic statistics.

(c) It is entirely a matter of national policy whether any government extracts the cost of this operation from its own airlines or passengers—or alternatively, passes on any profits to its own airlines.

(d) Two governments such as the UK and the USA may well wish to arrange the total amount of credits in relation to the amount of traffic so that the transactions more or less balanced and that the net amount payable at the end of, say, twelve months, would be virtually zero.

(e) Other governments might prefer to use this opportunity to cut down on their own long-haul activities (or air navigation facility costs) and might prefer to collect these credits as additional revenue and might announce, for example, standard rates for any airline of any country.

(f) Governments would regulate their own airline frequency and capacity offering not by agreement with another government but solely in relation to the cost of their own airline's operations—in terms of foreign traffic credits.

(g) Government negotiations would then be directed principally at two matters: (i) the naming of agreed ports-of-call; and (ii) the agreement on foreign traffic credits.

(h) The result would undoubtedly be some genuine government "horse-trading" at bilateral negotiations, as opposed to the present occasionally bitter exchanges between the real interests in the background—the airline representatives who are always the *eminences grises* on such occasions.

(i) The ridiculous spectacle of two governments arguing about the rights of their nationals to operate commercially from a third state's territory would be eliminated.

The governments would be wise to agree on a further principle—that the object of their agreements is to facilitate and reduce the cost of international air transport to the public.

Some Possible Difficulties

There are difficulties in the scheme. For example, a government might find it was losing a lot of money by the operation of one of these "open-sky" cash agreements. It might then try to recover the cost from its own airlines (whose operations gave rise to these charges). This would then result in additional costs of airline operation—and could well defeat the cost-cutting principle suggested above. A desirable objective for any government which operated schemes of this nature might be to balance its books only in the overall balance from all operations from all countries where its airlines operate.

One result of the above ideas would probably be to substitute confidential and private agreements on the rates for foreign traffic credits in place of the present confidential agreements about capacity and frequency. Opinion may be divided as to whether this is a good thing. International airlines whose traffic is not dominated by Fifth Freedom considerations [such as BEA] may find little merit in the schemes because they can achieve most of the results they want by a vast mixture of third and fourth freedom traffic. This is not an argument against rationalization. It is an argument in favour of the removal of theoretical restrictions which in practice can often be circumvented by subterfuge or secret agreement—like pooling.

If the "open-skies-for-cash" principle became popular, there would be a difficult period of transition. Some bilaterals would be on the old basis and some on the new. The situation might even call for an international conference. Some countries might find interesting benefits in their balances of foreign exchange. Others would be tempted to abandon the whole scheme in favour of a complete "open skies" policy. If this is done, the last measure of flexible control disappears. There is no reason yet to think this is desirable or attainable.

But to make economical use of the present and future generations of high-speed high-cost transports, something better is needed than the present tangle of over 500 bilaterals. International ownership, control, leasing, crewing, maintenance and route-pooling of this expensive generation of aircraft will soon make nonsense of many older international rules. Here is a possible path through the jungle.

SPARING A THOUGHT FOR SPARES

IN these days of high-cost spares the trend is away from individual airline provisioning. Spares pooling is the quick answer to high spares investment and the more airlines that can be persuaded to join a pool the more economically replacement availability can be guaranteed.

It is natural that the Boeing 707 and the DC-8 should be the pace setters here. Both types have received orders from many different airlines and spares for both are more expensive than spares have ever been before. Six airlines have set up a DC-8 spares pool at 25 airfields throughout the world. The operators are Alitalia, JAL, PanAm, KLM, SAS and Swissair, and at each of the designated airfields a number of sets of spares (each worth at least $87,000) have been laid down and are available to any of the six. There seems little doubt that the scheme will expand.

PROGRESS WITH THE ATL-98

Aviation Traders' Ingenious Conversion of DC Types for Car-ferry Operations

THERE seem to be two distinct replacement patterns for the Bristol 170 Freighter and Super Freighter on the cross-Channel air ferries. The first, favoured by Silver City Airways, is a twin-turboprop, fat-fuselage type with room for six cars side-by-side in pairs; the important point is that it is a new project (not yet ordered or detail-designed) for which no power-plant other than a gas turbine is to be considered. The other project, already ordered by Air Charter, is a nose-loading conversion of an existing design. It will accommodate five or six cars end-to-end and, almost fortuitously, has four piston-engines.

This dichotomy of design ideas for the air ferries has its roots in the extraordinary difficulty of carrying passengers and a low-density (4lb/cu ft against the normal freight minimum of 8lb/cu ft) car cargo across a handful of miles of sea. Both operators are searching for ways of increasing their route mileage and their utilization, notably by "deeper penetration" route applications and by extending the versatility of their designs. Silver City's aircraft (see *Flight* for April 29, page 607) has possibilities as a 100-seater airbus with a "panoramic" nose after the style of Jack Frye's piston-engined Safari. The rival ATL-98 design (page 255, February 19) could be applied to the DC-6 to give nose-loading to the world's most successful freighter.

Aviation Traders (Engineering) Ltd, whom *Flight* visited recently, see as a great advantage of their project the fact that it is under construction now. The first ATL-98 should fly in January or February 1961—or possibly even by the end of this year. They have slipped about six weeks behind schedule, but should hold it now, and two aircraft should be in service next year. The second ATL-98 will follow on about two or three months after the first and, "if we don't run into any bad luck," two of Air Charter's ten new aircraft should be ready for service by early June. They describe this as "a difficult but not an impossible target." A third aircraft will follow to complete the pre-production batch.

The top deck of the first aircraft is taking shape in its jigs. The new nose is built in two parts, split longitudinally below the cockpit floor. Between this and the new freight nose are "fill-in" panels on each side which allow for some tolerance in the mating of the big forward section to existing DC-4 (or, eventually, DC-6 or DC-7) fuselages. The top half will be completed in advance of the lower, and while the next assembly is in the jig the first will have US equipment installed; it is fairly self-contained. The DC-4 cockpit and controls layout is incorporated practically unchanged, but re-routing the 150-odd control runs into the wing has been a major task. Because the original Douglas engineering has been altered as little as possible, no installation mock-up has been built

Wooden structural mock-ups of the top-deck section and nose

Forward top-deck section of the first aircraft in its assembly jig. The nose is built in two parts, split longitudinally on the line of the floor

and, as the company point out, "one thing we are not short of on the upper deck is installation space."

Other engineering changes involve construction of a one-piece clamshell door and re-flooring and stiffening of the rear fuselage to accommodate a new fin of DC-7 size. The new fin requires strengthening of the attachment points and bulkheads and an inner skin is to be applied to the rear fuselage up to the transport joint just ahead of the fin leading-edge. Some minor stiffening is to be applied ahead of that.

Strengthening of the floor is an operation that can be carried out to order: Air Charter require reinforcement to withstand tyre loads and to accommodate wheel shackles; Ansett-ANA, whose interest in the design was announced recently, are thinking in terms of a stainless steel-over-wood floor for the transport of cattle. The nose door should present few problems; it is to be semi-manually opened by an hydraulic hand-pump within the fuselage. It will open through 180° in the same time as is taken by the divided doors of the Bristol 170.

Conversion-kit Details

ATL-98 conversion kits will consist of the new door; upper, equipped nose-section; lower section; and bits and pieces for stiffening the rear fuselage. No undercarriage modifications other than new nosewheel doors are involved, except to restrict the retraction travel of the nosewheel. Kit transport "could be a problem," but for air freight the upper and lower sections could, if necessary, be split again down the longitudinal centre-line.

Aviation Traders are encouraged by the estimates given by the ARB for aerodynamic clearance of the aircraft. Some 120 hours' tunnel running on a 1/24-scale model of both the DC-4 and ATL-98 conversion were completed at Cranfield, with the derivates of the latter plotted and adjusted until roll, directional stability and C_L characteristics met those of the DC-4. The fin size came out at about that of a DC-7 and an 18° yaw could be developed without premature stall. Nevertheless a dorsal fin "has been kept up our sleeve." Visited by Mr Leftly, Aviation Traders' chief designer, Douglas at Santa Monica gave very free access to their design records and test results, and offered advice about the shape of the nose.

During wind tunnel work the rear canopy was re-shaped to smooth out a kink in the pitch curve, but otherwise major changes were few. Full-scale lofting and photographic templates have been employed. In one respect the new nose provides a bonus; it brings the c.g. forward, so that stability problems at aft c.g. should be eased. Mr Leftly says that the Douglas attitude is one of "wait and see," and no doubt operators too are watching this project with interest. There have been a considerable number of inquiries.

Now that the bulk of design work is behind them, Aviation Traders say that the conversion price, complete for a finished aircraft, should still be about the original figure of £150,000. Even if Air Charter are the only purchaser the price to them should still be "reasonable." ATL-98 cost should, in fact, remain fairly stable; even if the usual processes of rising production costs apply, there is every indication that the prices of used Douglas airliners will continue to fall.

A. T. P.

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

DC-1 Enshrined?

THE letter from Dennis Powell in your issue of June 10 recalls the considerable excitement I experienced in tracing the fate of the DC-1 when it had apparently faded from the records.

The aircraft actually finished its life at Malaga where, as Mr Powell says, it was dismantled, although photographs in my possession would lead me to believe that there must still be pieces of it lying about. It would be interesting to know if any of your readers have seen these.

I understand that part of the aircraft was incorporated into a litter upon which the statue of the Virgin Mary is borne through the streets of Malaga on saints' days. Perhaps a rather appropriate ending to such a famous machine.

Gatwick, Surrey D. J. SPURGEON,
Public Relations Officer, Transair Ltd

One-way Transports?

A MAJOR war in which, by tacit consent, the contestants refrain from using nuclear weapons is regarded by a number of responsible authorities as a contingency of such likelihood as to render provision against it essential. The argument is, broadly, that with an approximately equal balance of nuclear armaments between East and West, sufficient on either side for the devastation of the other, resort to this ultimate form of force either by aggression or defence could only result in mutual annihilation, a prospect which even fanatical Communists could hardly regard as desirable or necessary.

In a war fought with conventional weapons the first requirement for the survival of Britain is the maintenance of supplies of food, oil and other commodities from North America and more distant lands. During the Second World War the total of essential imports amounted to nearly one million tons *every week*, of which all but a minute fraction came by sea.

The potential submarine threat to our shipping is far more serious now than it has ever been before—the Russians are well aware that U-boat campaigns nearly brought about our defeat in both world wars and they have built up their submarine strength until it numbers over 500, or roughly ten times as many as Germany possessed at the beginning of the last war. It has been made clear on a number of occasions by NATO maritime commanders that the anti-submarine forces at their disposal are quite inadequate to meet this threat and it therefore appears probable that in a conventional war our seaborne supplies would be drastically curtailed, if not cut off altogether. (It may be noted, in passing, that this would result, inter alia, in the grounding of the RAF in Britain, for whose aircraft there would be no fuel.)

If, for the sake of argument, the future possibilities of submarine or hovercraft cargo carriers are disregarded, is it feasible to bridge the gap between minimum war import requirements and actual seaborne arrivals by means of air transport?

At first sight such a proposition must seem hopeless to the point of fantasy, bearing in mind that in addition to freight, the aircraft engaged would have to fly-in sufficient fuel between them for their own return journeys to the nearest North American bases. The number of transport aircraft in existence capable of making a double crossing of the Atlantic without refuelling is very small and the loads which they could carry in these circumstances quite negligible. They are also large and complicated, and therefore slow to produce and very costly both in terms of finance and production man-hours. Even when nuclear power becomes available for aviation the cost of air supply in this form is virtually certain to prove absolutely prohibitive, even in a war economy.

At this point it becomes relevant to turn to a most remarkable project undertaken by Germany no less than 43 years ago—in 1917—for the direct air supply of her troops fighting in Central Africa over 3,000 miles from her nearest European air base at Jamboli in Bulgaria. The plan was for a one-way only flight by the Zeppelin L.59, so that the question of fuel for a return journey did not arise. In addition to a payload of military supplies and munitions the Zeppelin incorporated in her construction further materials and components required by the ground forces, for example, catwalks were floored with boot leather, the envelope fabric was to be made into tents, girders into wireless masts; and the engines, running on fuel remaining on arrival, were to be used for powering various ground installations. Teutonic thoroughness and ingenuity ensured that nothing would be wasted when the ship was dismantled.

In the event, L.59 reached the latitude of Khartoum but was then recalled, apparently because the German Colonial Office had been hoodwinked by British Naval Intelligence into thinking that their African forces were on the point of surrender—which was, in fact, far from being the case. The Zeppelin returned safely to her base at Jamboli, having flown for more than 4,000 miles and for 95 hours and, still with sufficient fuel remaining for a further 64 hours' flying, an astonishing achievement then and not at all inconsiderable even by the standards of today.

This project contains the two basic ideas upon which an effective transatlantic air supply must be based during the foreseeable future: first, that the operation should be one-way only; and second, that the air freighters should themselves be designed for dismantling into useful components and materials. It would, of course, be a gigantic undertaking but one susceptible to the mass production and automation organizational methods in which America excels.

By way of illustration, let it be supposed that seaborne supplies have been completely interrupted and the extreme case has to be faced of the air supply of one million tons a week. This might be split into (say) 20,000 units of 50 tons, comprising the weight of actual freight plus the weight of useful materials and components in the carrying aircraft. Such numbers would rule out human aircrew and the aircraft design would have to follow the pattern of the V.1 flying bomb but with remote-control guidance. It seems probable that the freighter assembly plant would have to be located at the actual point of departure and into it would be fed the components and materials for aircraft construction, the fuel for the one-way flight and the cargoes to be transported. At the end of the assembly line the completed freighter, fuelled and loaded, would become airborne on its single operational mission. At the receiving end in Britain a dissecting plant would be required into which the freighters would be fed on landing (at the rate of two a minute, if there is one such plant only). Here, cargo would be removed and sorted, surplus fuel piped off and the aircraft themselves dismantled into useful components and materials. Once the plants and organization had been set up it seems possible that the only major increase in cost over supply by sea might be that of fuel for the freighters.

Naturally, it is to be hoped that some seaborne supplies would get through and provision for the extreme case might prove superfluous. Even so, many may feel that a project of this nature, though on a smaller scale, would still be entirely beyond the industrial and economic capacity of the most advanced and wealthy nations. If they are right, the fact must be faced that, since this is the only method of air supply that could conceivably be effective, any other must fall short by a far greater margin and the national survival must continue to depend on sea transport, for whose defence much greater effort and resources than at present will have to be allocated.

Southsea, Hants F. P. U. CROKER

Zero Payload Vehicle

I RECENTLY read in Roger Bacon's column about a projected Mach 3 VTO airliner, and I made the following calculations. Assuming the aircraft to weigh some 400,000lb fully loaded, it will need at least 16 engines each developing 30,000lb thrust. With a total of 480,000lb thrust and an s.f.c. of 0.75 the fuel consumption will be 360,000lb/hr at sea level (full thrust). If landing and take-off take 5min each, the fuel needed will be 60,000lb. Adding another 10min hovering reserves makes a total 120,000lb for landing and take-off alone—or, on a percentage basis, 30 per cent of loaded weight. The weight of fuel needed for the trip should be at least equal (particularly with fuel lost by evaporation at M3), or another 30 per cent.

With a power-to-weight ratio of 6 : 1, engine weight will be 5,000lb × 16 = 80,000lb, or 20 per cent of loaded weight. With a total of 80 per cent that still leaves a modest 20 per cent for the monstrosity's structure (what other name for a 16-engined craft?). And that leaves an even more modest percentage for the payload—namely, 0 per cent.

Alexandria, Egypt NABIL ANAWATI

FORTHCOMING EVENTS

June 25. RAFA Air Display, Staverton.
June 25-27. RAeC: Invitation Air Rally, Escoublac/La Baule.
June 28. Guild of Air Pilots and Air Navigators: Presentation of Meteorological Office Awards.
July 1-4. Bienne Aero Club: Swiss Watch Rally, Bienne.
July 1-4. Palermo Aero Club: Aerial Tour of Sicily.
July 2-3. Flying Doctors' Meeting, Vittel.
July 2-4. Royal Aero Club: Invitation Rally, St Gatien, Deauville.
July 2-10. West Aero Club of France: Gliding Competition, Angers.
July 7-10. International Light-aircraft Show, Venice.
July 8. RAeS Astronautics and Guided Flight Section: a.g.m.
July 8-9. Royal Aero Club: Lockheed International Aerobatic Competition and King's Cup Race, Baginton.
July 8-10. Italian Aero Club Competition.
July 9. RAFA and Exeter Airport Ltd: Display, Exeter.
July 9-10. Basse Normandie Aero Club Rally, Flers.
July 10. Elstree Flying Club: Pilot's Rally, Elstree Aerodrome.
July 10. Leicestershire Aero Club At Home, Leicester East/Oadby.
July 16. Parachuting Competition, Woburn Abbey.
July 17. Royal Aero Club Rally, Woburn Abbey.

Upward visibility strictly limited

Wind, storm-clouds, bursts of sunshine . . . perhaps not ideal garden-party weather, but at least it didn't rain

Landing area . . . truly rural

UPS AND DOWNS at the Helicopter Garden Party

GORDON HORNER recorded these impressions at the Royal Aeronautical Society's annual rotorcraft rally, briefly reported in "Flight" last week.

The lovely setting of Dunsborough House, the Hughesdons' Surrey home, is seen at its best from the air

THE INDUSTRY

H. G. Conway, Short Bros managing director and chief engineer (right) demonstrates one of the company's new airfield freight lifts to Air Cdre C. Broughton (left), Transport Command SASO, and Wg Cdr A. W. G. Le Hardy, CO of No 511 Sqn. The lifts are being supplied for use with Short-built Britannias now in squadron service at Lyneham

The Racal organization recently celebrated ten years' progress in the electronics industry by holding a cocktail party at the Savoy Hotel. Seen here, l. to r., are R. F. Brown, Racal chairman; C. P. Edwards, MoA; and Gp Capt E. Fennessy, Decca Radar managing director

Sir Ralph Sorley Retires

AT the end of this month Sir Ralph Sorley, KCB, OBE, DSC, DFC, FRAeS, retires as deputy chairman and managing director of de Havilland Propellers Ltd and a director of de Havilland Holdings Ltd. He is succeeded in these posts by H. G. Sturgeon, OBE, deputy managing director for the past three years.

Sir Ralph joined D.H. in 1948 as chief executive and a director of the Propeller Company, at a period when the latter concern was faced with a falling-off in military orders; aided by strong technical and administrative teams, he was responsible for diversification into new fields, notably those of guided weapons and electronics. His Service career, which began in the RNAS in 1914, was marked by high technical ability; among posts which he held was that of Controller of Research and Development in the Ministry of Aircraft Production from 1943 to 1945. He was a strong advocate of large aircraft, and his persistence was one of the factors leading to the formation of the Brabazon Committee to consider post-war transport requirements.

Sir Ralph Sorley (left) and his successor at the D.H. Propeller Co, H. G. Sturgeon

Mr Sturgeon came to de Havilland Propellers in April 1957 after a career in the electronics and light engineering industries which began with employment with Pye Ltd in 1928. After Army service during the war he held a succession of responsible posts in Ultra Electric Ltd, and was assistant managing director of their holding company when he left to join de Havilland.

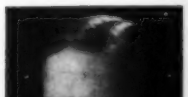
Teleflex Equipment for New Aircraft

TENSION regulators are being manufactured by Teleflex Products Ltd, of Basildon, Essex, for the Vickers-Armstrongs VC.10, and will be among the equipment tested in Vickers' flight simulating rig. The Vanguard is also equipped with Teleflex tension regulators and screw-jacks.

Many other new aircraft will also have three Teleflex regulators, among them the Short & Harland Britannic, the Avro 748; and the Armstrong Whitworth A.W.660.

Teleflex inertia-lock crew harness, state the manufacturers, has been ordered for every type of BEA aircraft—Viscounts, Comets, Vanguards, Heralds, Herons and the D.H.121—and for the Fokker Friendship, which also uses tension regulators and remote controls. Finally, a second order for tension regulators has been received for the de Havilland Sea Vixen.

INDUSTRY IN BRIEF



Appointed sales manager of Bristol Aerojet Ltd, the Anglo-US company which makes the majority of British solid-fuel rocket cases, is A. G. Shove, AFRAeS. Beginning with an apprenticeship at Airspeed Ltd, where in ten years from 1936 he rose to be assistant to the chief designer, he was later with Blackburn—at one period he was their sales representative in Canada—and then with Napier, as sales manager (overseas)

Lionel Harper has been appointed managing director of Dowty Hydraulic Units Ltd. Canadian by birth, and formerly managing director of Massey-Ferguson (Gt Britain), during 23 years he has made important contributions to the mechanization of agriculture.

Previously assistant chief engineer of D. Napier & Son Ltd, C. D. Carmichael has been appointed chief engineer of the Engine Components Division of Associated Engineering Ltd.

Piaggio have ordered from Heenan & Froude Ltd a thrust cradle for testing the Bristol Siddeley Vipers which they are making under licence. Two such cradles, for small turbojets of up to 3,000lb thrust, have been used by Bristol Siddeley for some years.

At a recent dinner to delegates to the Safety of Life at Sea Conference, given by Ultra Electronics Ltd, A. V. Edwards (managing director) presented silver tankards to Flt Lt D. J. Wyborn of No 29 Sqn, who received them on behalf of Flt Lt J. F. Wilson and Fg Off E. Wood. These were the two Javelin-collision survivors who were rescued from the North Sea after their Ultra Sarah signals had been picked up. A stereogram for the St Mawgan officers' mess was also presented to Flt Lt V. C. Letchford, a member of the crew of the No 42 Sqn Shackleton which received the signals and directed a helicopter search.

Starter selection by Blackburn Engines: in the foreground is the basic Palouste unit, and to the left the pod for underwing transport, as used in Naval aircraft. At the back are a starter truck (this one is used for starting BOAC 707s), a trailer and—also in RN use—a trolley

First air-to-air shot of the latest Comet to be delivered—a 4C for the United Arab airline

AIR COMMERCE

Britain's Air Traffic

A QUICK first glance through the Ministry of Aviation statistics published last week indicates that the financial year ended on March 31, 1960, was a boom year for Britain's air traffic. In a nutshell, total scheduled traffic carried went up by more than 20 per cent, to some 408m load ton-miles. This is one of the biggest yearly expansions on record, and it compares with the previous year's growth of only 7.4 per cent.

Load factor, that important economic index, put on a good deal of healthy weight—no less than two percentage points, going up from 58.4 per cent to 60.6 per cent. In terms of revenue, this must have been worth (at last year's average revenue rates) something like £3 millions.

BEA improved their load factor by a spectacular 7 percentage points: this was because they increased output by a cautious amount (less than 5 per cent), while selling 17 per cent more of their space than they did last year. At first sight it appears that BEA could have put on more services while still making a profit. As it is, net profit (Lord Douglas has estimated) is likely to be of the £2 million order. No utilization figures are yet available, but it is likely that BEA's Viscount capacity was in fact fully extended.

BOAC increased output by an exuberant 22.5 per cent. They nevertheless managed to hold load factor (56.8 per cent) at roughly last year's level, sales going up by nearly 22 per cent. But BOAC's load factor is still too low for comfort: had it been in the sixties as it has been since 1951-52, the corporation would have made a healthy net profit last year instead of the £1 million loss estimated.

By far the biggest BOAC expansion took place on the western routes, this being the first year in which these routes accounted for more than half BOAC's output (see below for notes on North Atlantic traffic). BOAC increased capacity on its western routes by more than 45 per cent, compared with less than 6 per cent on eastern routes. It is obvious in which direction BOAC judges its future profitability to lie.

There are other interesting figures to be picked out of the 1959-60 statistics just published by the Ministry. BOAC's western-routes freight business went up nearly 40 per cent, and BEA's total freight rose by an encouraging 26.8 per cent, both these trends indicating that the corporations are paying more than lip service to cargo. BEA flew 1.1 per cent fewer hours than in the previous year, which is surprising in view of the fact that faster aircraft in the shape of the Comet 4B were not employed until April 1, when the financial year had ended. BEA's international mail, its highest-revenue load, dropped by 2.2 per cent, the reason for which is not yet clear. Most surprising is the extent to which the independents' inclusive tour business dropped: this went down by more than 10 per cent. Judging by the shortfall in bookings for the current season there are signs that the package tour business is waning in popularity—though no one can tell how much "pirate" business was operated by independents who short-circuited the "associate" agreements. Even in this field (next year to be illegal) there are signs of a slump (*Flight*, April 8, page 468, "Not the Whole Picture").

1959 Calendar-year Picture

How fares Britain's international air traffic as a proportion of total international world traffic? Ministry figures for the calendar year 1959 and the *preliminary* ICAO figures for the same year suggest that the UK share of passenger-miles is now 7½ per cent —about the same as in 1958. The United Kingdom ranked second to the US in 1958 (the American share being 31 per cent), with France next, followed by the Netherlands, Canada, Switzerland, Sweden, Belgium, Mexico and Australia.* This order of precedence is in respect of *international* operations only. When domestic operations are included the UK is still second, the others in the Top Ten being, in order: France, Canada, Brazil, Australia, Netherlands, Mexico, Belgium and Switzerland. The US share of total world scheduled traffic, international and domestic, is still more than 60 per cent.

THE CORPORATIONS' SCHEDULED TRAFFIC, 1959-1960

	BOAC	% change on 1958-59	BEA	% change on 1958-59
Capacity ton-miles (1,000) ...	432,872	22.5	188,843	4.7
Load ton-miles (1,000) ...	245,684	21.9	127,304	17.2
Overall load factor	56.8	57*	67.4	60.2*
Passengers carried	590,977	25.6	3,289,606	16.3
Passenger-miles (1,000) ...	1,833,213	25.6	1,153,785	16.7
Freight ton-miles (1,000) ...	41,931	16.4	16,584	26.8
Mail ton-miles (1,000) ...	22,494	8.1	4,001	—1.4

*Actual 1958-59 load factors. Source: Ministry of Aviation. Preliminary estimates only pending publication of the Corporations' annual reports.

1959 North Atlantic Picture

The total number of scheduled passengers flown between Europe and North America (i.e., USA and Canada) by 17 carriers in 1959 was 1,367,287, 14.8 per cent more than in 1958. Of these, 15½ per cent—211,359 passengers—were carried by BOAC. The significant point here is that BOAC were the No 2 airline North Atlantic carrier in 1959, having ousted TWA from second place early in the year. TWA again overtook BOAC in November—the result, no doubt, of the US airline's introduction of the 707.

No 1 airline was, as usual, Pan American, whose share was nearly one-quarter. TWA's share was just over 10½ per cent, making the total American share of North Atlantic traffic just over one-third, rather more than double the British share. These figures of course include Europe - Canadian traffic, which PanAm and TWA do not carry; it is perhaps fairer to see how traffic was shared on the European - US routes, excluding Canada.

There were 1,204,377 passengers carried both ways between Europe and the USA in 1959. PanAm carried 28 per cent, BOAC 13½ per cent, and TWA 12 per cent. The American share of this traffic, which is predominantly American in origin, was therefore 40 per cent, with BOAC still holding second place, lying between PanAm and TWA. Though no figures are available, BOAC are believed to have carried considerably more than half the UK - US traffic.

For the record, North Atlantic economy class accounted for 73.7 per cent of the business; 21.5 per cent was first class; and 4.8 per cent was tourist class. In 1960 we can expect to see, now that tourist has virtually gone (it will be completely finished next week), first class and economy being sold in the proportions 20 per cent and 80 per cent—the proportions of seating now being scheduled by BOAC. Whether the corporation will regain second position on the North Atlantic in 1960, particularly after the six-week 707 delay, remains to be seen. Judging by the way the corporation is increasing output on these western routes it looks possible. The sign "BOAC is our real competition" has been seen in several TWA sales offices recently, according to Harry Good, BOAC's sales manager in the US.

J. M. R.

**ICAO "Digest of Statistics," No 75, page 40.*

AIR COMMERCE . . .

NOISE AND PUBLIC RELATIONS

JET noise is second only to safety in importance, in the view of the US Federal Aviation Agency. Speaking recently in Columbus, Ohio, to American airport operators, James T. Pyle, FAA deputy administrator, said: "A proper solution of our dilemma can begin *only* with the recognition of one fact. *All* members of the aviation community—including airport operators—share the responsibility for reducing this nuisance to acceptable proportions. It does no good to try to place the blame or avoid blame. Whatever the justice of the complaint might be, the censure for noise falls first and heaviest on the airport itself. It is thus mandatory that airport operators assist in this problem."

Mr Pyle went on to give expression to the belief that good public relations is an important factor in the airport noise problem. He said that perhaps a good deal of public anger stems from fear and ignorance—"a loud noise has from time immemorial meant danger." He recognized the public feeling that "nobody in aviation is doing anything about the noise problem." These misapprehensions could, in his opinion, be corrected. It is "in the field of education," he said, "in the field of community relations that the airport can provide a genuine service to aviation today."

To the airport operators he added: "Tell them [the public] that aviation is concerned with the noise problem. Tell them we are working on the solution. Help them understand. . . . Unless we in the aviation community solve it by ourselves, we will be forced to accept a very harsh solution imposed on us from outside. In blunt terms . . . this could mean a restriction on carrier operations. It could well mean the shutting down of certain airports."

"OUR FINAL FIGURE"

IN the same address as that referred to above, Mr Pyle had a word to say to airport operators about the increasing length of runways. "In the past," he said, "to accommodate the new turbojet transports, the Government decided to increase Federally sponsored runways from a maximum 8,400ft to a maximum uncorrected length of 10,800ft. Let me say, gentlemen, right here and now—this is our last increase. We have made it indisputably clear to the carriers and the manufacturers that this is our final figure. We shall not in the future provide Federal aid for the construction of runways of greater length. We do not intend to solve aviation's problems by adding more cement. This Federal limitation should provide a measure of deterrence to any future unreasonable demands."

ALITALIA GET LOS ANGELES

IT is expected that, as a result of the recent US-Italian bilateral agreement negotiations, Alitalia are to be granted traffic rights in Los Angeles. It is understood that these rights apply to flights from Rome via intermediate points, including Montreal.

It is reported also that Alitalia are to have traffic rights at Chicago; whether this city is one of the intermediate stops on an Italy - West Coast route is not yet known. Furthermore, Italy's fifth freedom New York rights are to be broadened to include a foreign "beyond" point, to be decided upon later.

In return the US has won from Italy a promise to supply origin-destination traffic statistics in respect of Italian traffic (presumably between Italy and the USA). In addition, the Italians have added Genoa and Turin to the cities which may be served by US carriers.

ANGRY PRESTWICK MOTORISTS

THERE was a three-hour road traffic jam at Prestwick Airport on June 17 as a BOAC 707 practised take-offs and landings on the main runway, which cuts the Glasgow - Ayr highway. After motorists had waited in mile-long queues at the airport's "level-crossing," Ayrshire County Convener Daniel Sim said: "I will call for an inquiry tomorrow." Motoring organizations were later bombarded with complaints from drivers who had been delayed for almost an hour. A police official reportedly said: "There were even cars stranded on the 200yd runway strip between the crossing-gates. Things were almost out of hand at times, especially when the aviation factory workers in buses and cars were going home."

Mr Sim, coming to the real point at issue here, said: "There was never any hint that the traffic would be upset to this extent, particularly by training flights. We have pressed for a tunnel. We knew it was the only solution. But the Ministry of Aviation rejected it. This has proved that we were right."

A BOAC official said: "We have to make these flights to train our crews to use Prestwick Airport. We would be blamed if anything were to happen, so our crews have to make familiarization flights. The only alternative would be to stop using jets at Prestwick." Last year an inquiry commission agreed with local authorities that the road tunnel proposal was the only solution for Prestwick, but the Ministry overruled the decision.

Two of the ex-Air France Viscount 700-series bought by Maitland Drewery Aviation Ltd ("Flight," June 3, page 774) have now arrived at Cambridge, where they are seen here. They are to be maintained by Marshall Flying Services. The sale was handled by W. S. Shackleton—the first involving Viscounts handled by this company, which now claims to have sold 154 different types of aeroplane

THE COMET AND LATIN AMERICA

IT is reported from Argentina that FALA, the projected union of the smaller non-IATA airlines of Chile, Colombia, Panama and Peru, are interested in getting Aerolineas Argentinas to join. This Aerolineas may do—provided the others purchase Comet 4s in order to unify equipment with the Argentine airline, which has four Comet 4s. The de Havilland Aircraft company, according to an Argentine source, has approached the FALA airlines "with a very tempting offer" of six to eight Comet 4s at extended credit terms and with early delivery.

Other news from Latin America is that Cubana, a Britannia and Viscount operator, has been encouraged by the Castro government to consider the East German BB.152 short-range jet, and that the Government has approached the manufacturers to send an aircraft to South America for demonstration. Meanwhile Transcontinental, the Argentine independent, has refuted allegations that its order for four Convair 880s has been cancelled; they say that they are to have Convair 600s instead, and intend to operate them on a new route to Japan.

UNREST ON THE FLIGHT DECK

BOTH Eastern Air Lines and Pan American schedules have been severely disrupted recently by the refusal—tantamount to a wildcat strike—of pilots to allow FAA flight inspectors to sit in the third pilot's seat while carrying out their inspection duties.

The pilots' Association, ALPA, has advised the men to go back to work, and has made clear that it does not deny the right of the FAA to inspect crew standards in flight. But it says that this must be done without infringing pilots' contracts that call for three-pilot-crew operation.

In the UK no flight-inspection of pilots (not to be confused with routine type-examination testing) is carried out, though there have been suggestions that such a scheme might be introduced.

CAPITAL'S DAY OF RECKONING

LATEST development in Capital Airlines' struggle for survival is the appointment of Gordon Billard, a New York investment banker, to the board of directors and executive committee. Meanwhile the third extension of Vickers' foreclosure proceedings, announced on June 3, gives Capital until next Monday, June 27, to file an answer to the British manufacturer's claim for $33.8m (£12m) outstanding on the airline's Viscount payments. Previous developments in Capital's fight were recorded in our issues of May 13 (page 668) and April 29 (page 610).

Capital president David H. Baker carried out in May a reorganization of top management to boost revenue and reduce the operating deficit. Thomas D. Neelands, a Wall Street consultant and merger specialist, and former Capital director, was recently appointed chairman of the board and has been in the UK for discussions with Vickers and the other parties concerned.

Vickers, who hold a mortgage on 89 of Capital's fleet of 90 aircraft, actually filed the foreclosure suit on April 18. To answer this suit Capital was later granted three extensions of time, one of 18 days expiring on May 27, one of ten days granted on May 26 and a third granted on June 3. After Mr Neeland's visit to this country it was rumoured that Capital is working on an arrangement whereby a leasing company would take over the Viscounts and lease them back to Capital. This is one of several ideas for avoiding foreclosure believed to be under consideration.

Capital's situation seems to have improved, if only relatively. On May 27 the CAB dropped its plan to make a thorough investigation of the airline's financial position following Capital's withdrawal of its request for an annual subsidy of $12.9m. The airline hopes to gain from fare increases due on June 30 as a result of

the four-year-old General Passenger Fare Investigation, in which Capital had proposed a five per cent increase plus a one-dollar surcharge per ticket. This would, it is hoped, result in a revenue increase of some $7m a year over the 1959 total.

The 12 US domestic trunk airlines lost $13.5m in the first quarter of this year (of which Capital lost $5.4m) compared with a net profit of $7.7m in the first quarter of 1959. The old problem of costs rising faster than revenue is being accentuated by rising jet capacity, while a combination of bad weather, accidents, Electra restrictions and bomb hoaxes have combined to reduce traffic. So Capital's pleas for fare increases will not be frowned upon as an isolated case, but take their place in the general—and rather ominous—picture of an industry that has over-mortgaged itself in the re-equipment scramble.

Vickers are said to have played no part in Capital's decision to withdraw its request for subsidy, nor in the recent management changes. The latter have not met with the approval of the Capital Shareholders Association which was formed by pilots of the airline last August and which has grown very rapidly in membership from 300 to about 2,500. This body has filed with the US Securities Exchange Commission an application to solicit proxies to call a special stockholders' meeting with the aim of completely overhauling the board of directors, and especially of strengthening financial representation on it. The Association regarded the latest management changes as hardly sufficient to "keep the British away from our doors."

If Vickers should have to proceed with foreclosure, Capital would have no apparent option but to seek voluntary bankruptcy; both parties, naturally, have every interest in avoiding this state of affairs. The airline would then be run by a trustee who would be responsible for putting it on a sound financial basis. Capital's annual interest charges have risen from $220,000 five years ago to $2,790,000 today as a result of large-scale re-equipment, and their troubles have occurred in spite of a three-year period in which they were the only US carrier with turboprops.

LOUD AND CLEAR IN THE CARIBBEAN

THE world's largest and most up-to-date inter-island aeronautical telecommunications system, linking the eastern island territories of the West Indies, was officially inaugurated in Barbados on June 10. This new $2 million multi-channel VHF system was planned and installed by International Aeradio in conjunction with Pye Telecommunications, Ericsson Telephones and Creed & Co. It provides the most modern automatic telephone and teleprinter service for airlines operating in the Caribbean and gives instant contact between airports, airline offices and aircraft throughout the 24 hours of the day irrespective of weather and other conditions.

The system will be operated by IAL's subsidiary International Aeradio (Caribbean). It was formally handed over by G. R. Scott-Farnie, managing director of IAL. The first call (from Barbados to Trinidad) was made by the Federal Minister of Communications, the Hon Andrew Rose, and reception was loud and clear.

The network has a capacity of 12 separate and simultaneous voice channels plus 12/18 teleprinter channels, and provides an extensive area coverage air-ground system. The main route runs from Trinidad through Grenada, St Vincent, St Lucia, Dominica, Antigua and St Kitts, and through a link with All America Cable and Radio Corporation to St Croix, Puerto Rico and on by co-axial cable to North America.

Work began on the system four years ago when International Aeradio conducted an extensive survey to decide whether or not a VHF scheme was practical and to select sites. To make the project possible, roads had to be built to the mountain top sites, power supplies provided and hurricane-proof buildings erected.

AUSTRALIAN TURBINE UTILIZATIONS

AUSTRALIAN operators have been well known for many years for their high aircraft utilization and their Electra operations appear to have maintained the good record, despite the operational limitations.

Ansett-ANA introduced their first Electra, VH-RMA, on March 18, 1959, and up to May 27, 1960, it had flown 4,076 hours. It was the first Electra in the world to pass 4,000 hours, though Eastern's Electras were on service in February 1959. The second Ansett-ANA machine, VH-RMB, since May 13, 1959, has flown 3,899 hours. These two aircraft have more hours up than any other Electras in operation today. In addition to these operating hours, both have more than 50 hours up on delivery and other flying before regular operation. The third Ansett-ANA Electra, VH-RMC, has flown 1,520 hours since February 14.

TAA's first Electra, VH-TLA, flew 3,319 hours up to May 21 since it was introduced on July 4, 1959, and VH-TLB's figure was 3,231. Their third Electra is on loan from Qantas and has flown 713 hours since March.

TAA's 13 Viscount 756s in 1959 flew 38,393 hours, or 8hr 9min a day. Their two 816s flew 3,322 hours, or 8hr 13min a day, having been introduced in June. Ansett-ANA's 832s flew 7,585 hours or 7hr 48min a day, following introduction in March-May of 1959. The 747s flew 5,241 hours, or 7hr 18min a day. (All these statistics are block-to-block.)

TAA's Friendships were introduced in May-October 1959 and nine flew a total of 10,040hr, or 7hr 20min a day, in 1959. This is well behind West Coast's figures, but TAA is still operating some DC-3s. Friendship utilization will rise as the DC-3s fade away. The first Friendship, VH-TFB, from May 20, 1959, to May 14, 1960, flew 2,292 hours. (This is the aircraft that was lost earlier this month in TAA's first accident fatal to passengers.)

OVERSEAS AVIATION'S NEW HANGAR

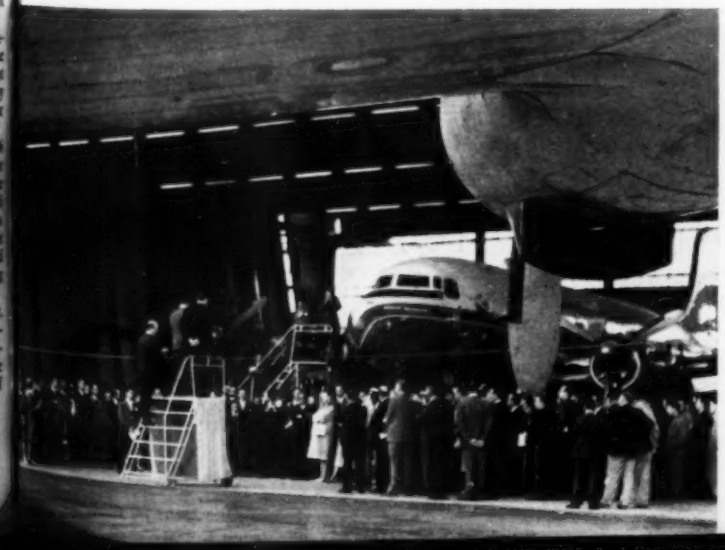
"NOBODY has been able to tell me of another company with a rate of expansion as great as that of Overseas Aviation," said Geoffrey Rippon, Parliamentary Secretary to the Ministry of Aviation, after opening the new Overseas hangar at Gatwick on June 14 (see photograph below). The hangar is unusual in that its structure is of timber. Cost was about £300,000.

Overseas are the second independent to establish a permanent engineering base at Gatwick, having previously—since their formation early in 1958—been based at Southend. The first Gatwick independent, now part of British United Airways, was Transair, who have been based there since the airport was opened in June 1958. An article in our issue of June 3 (pages 772-773) discussed the possibility of other operators basing themselves at Gatwick.

When the designers of the new hangar went to the Ministry of Aviation with plans for a structural framework of timber, the only query was on the grounds of possible fire risk. Obviously the question of fire endurance had been carefully considered, and calculations showed that the structure had a certain minimum fire endurance of half an hour. The Ministry asked for a fire endurance of one hour, and with the co-operation of the Ministry the design was submitted to the fire research station at Boreham Wood. The Ministry's requirement was met.

The point about timber is that it has a better fire endurance because it does not explode or expand, causing the collapse of supporting walls. It withstands normal building fires for longer periods than other materials before falling. In the case of Overseas' hangar there will, in the unfortunate event of a fire, be at least an hour available to clear the building of its personnel and contents. Architects were P. & D. T. Myers, London; main contractors were J. Jarvis & Sons Ltd, Paddington; structural timber framework was by Beves & Co (Structures) Ltd (Engineer: H. J. Andrews); and consulting engineers (foundations and apron) were Donovan H. Lee & Partners.

Overseas Aviation and BIATA: see page 882.



The scene at Gatwick on the evening of June 14 as Geoffrey Rippon, MP, Parliamentary Secretary to the Ministry of Aviation, formally opened Overseas Aviation's new timber-structure hangar (see note above). The hangar has a clear span of 150ft, is 150ft deep and 33ft high. It is the largest clear span timber building in the UK. On the steps with Mr Rippon are Ronald Myhill and, behind, Bernard Dromgoole, respectively chairman and managing director of Overseas. Fleet: 9 Argonauts, 5 Vikings and a Dove

Cambridge Airport now has Customs facilities, and airline companies are, say local interests, "expected to help develop its true potential for Continental traffic." The runway is 5,290ft, excluding over-run at each end. Visible is Marshalls' hangar, one of the biggest in Europe

AIR COMMERCE . . .

BIATA UNDER FIRE

LAST week an independent operator referred in critical terms to the trade association of Britain's independent airline industry, BIATA. Speaking at Gatwick in the presence of Geoffrey Rippon, Parliamentary Secretary to the Ministry of Aviation (see page 880), Bernard Dromgoole, managing director of Overseas Aviation, referred to his company as "the most independent of independents" and, commenting on BIATA, he said:—

"I wouldn't say we haven't tried to join BIATA. We have asked to do so on two occasions. . . . An organization like BIATA, purporting as it does to represent the whole independent industry, should be inclusive and not exclusive. There are now eleven independent companies outside BIATA." He went on to say that non-membership of BIATA does not imply poorer or lower standards of maintenance.

Among the eleven non-BIATA companies to which Mr Dromgoole referred are, besides Overseas Aviation (and not necessarily all of whom have applied for BIATA membership): Air Safaris, Air Condor, Falcon, Orion, Pegasus, North-South, Tradair and Maitland Drewery. There are 17 members of BIATA (or 13 following the welding together as British United Airways of the Airwork and Hunting-Clan companies), as follows: Airways Union, British United Airways (Air Charter, Airwork, Morton/Olley, Transair, Hunting-Clan), BKS, Britavia (Silver City), Cambrian, Dan-Air, Derby Aviation, Eagle, East Anglian (Channel Airways), Jersey Airlines, Scottish Airlines, Skyways, and Starways.

In general, members of BIATA are the old-established independent operators, whilst those who are not members are relative newcomers to the industry.

Asked later what reasons were given by BIATA for not accepting Overseas as a member, Mr Dromgoole said:—

"I have not suggested that BIATA have refused membership to Overseas Aviation, but that we have been made to feel that we would not be welcome. My view is that there cannot be two standards in this business, one set by the Ministry and another by BIATA. This allows BIATA to subject companies that are not favoured by them to non-objective criticism.

"Overseas Aviation have always maintained very high standards and if this had not been so we would not have been allowed by the Ministry or by the ARB to operate 15 aircraft. The attitude of our company towards BIATA or any other organization which purports to represent members of the industry is that it must be inclusive and not exclusive. We are all engaged in the same business and we all have to satisfy the Ministry of Aviation. Therefore all non-BIATA companies should be represented by BIATA and none who are allowed to operate by the Ministry should be excluded.

"Until BIATA change their attitude Overseas Aviation are not interested in becoming members."

BIATA's view is stated to be that the question of membership should be a matter between the applicant and the Association; that BIATA is not opposed to new membership and clearly wishes to be as fully representative as possible; but that it does not regard membership as the automatic right of any operator.

The Overseas application has not, it is understood, been rejected by BIATA, but has been under review.

SILVER CITY CELEBRATION

NO one really needs an excuse to hold a party in Le Touquet but Silver City gave three reasons for flying a Hermes-load of guests from Gatwick last week. It was the fiftieth anniversary of that epic two-way crossing of the channel by the Hon. C. S. Rolls on June 2, 1910; the twelfth anniversary of Silver City's own channel air ferry; and the official rebirth of Le Touquet (Paris-Plage) itself after its destruction by the RAF on June 13, 1944.

A gradual process of improvement at Le Touquet Airport during the post-war years was suddenly accelerated a few months ago and now a fine new passenger and vehicle building is finished and in operation. The old reception hall is being turned into a 24-hour buffet. To accommodate 88-seat Hermes 4s still another extension has been made to the riverside runway.

Commemorative Silver City luncheon at the Westminster Hotel, Le Touquet (see story above). On the right is Eoin Mekie, chairman of Silver City, talking to Monsieur Pouget, Mayor of Le Touquet since 1933. On the left is Mrs Kennard, wife of Silver City's managing director, and Maurice Smith, editor-in-chief of "Flight"

A COMMITTEE ON NOISE

THE "Committee on the Problem of Noise," of which A. H. Wilson is chairman and which was appointed by Lord Hailsham, Minister for Science, "to examine the nature, sources and effects of the problem of noise and to advise what further measures can be taken to mitigate it" is now ready to receive evidence from "persons and organizations with special interest or experience in matters relevant to the problem of noise."

Anyone wishing to give evidence should first write to the Committee's secretary, R. S. Matthews, Ministry of Health, Savile Row, London W1.

AIR UNION FURTHER DELAYED

THE date officially planned for the inauguration of Air Union, November 1, is now not likely to be achieved. This date itself was a postponement (*Flight*, March 11, page 353) of earlier plans to launch Air Union on April 1. The governments of the four countries concerned (France, Italy, West Germany and Belgium) have not yet agreed on details, and ratification by each country's parliament is not now likely to be obtained by November 1.

It is possible that the effect upon Air Union's operations of the US Anti-Trust Law is causing negotiations to be more protracted than was expected. As discussed in a leading article on January 8, American law in respect of cartels has to be carefully taken into consideration by foreign airlines operating services in pool. It is probable, too, that the bilateral air agreements between the USA and the four Air Union countries specify national ownership of the designated carriers concerned.

Meanwhile Air France, Alitalia, Sabena and Lufthansa are progressively co-ordinating more and more of their current schedules and are extending co-operation in technical services. Some overseas sales offices of the airlines concerned are reported to be already trading under the Air Union banner.

OLD AIR NAVIGATION ORDER CHANGETH

A REVISED Air Navigation Order has been laid before Parliament with the aim of re-arranging and consolidating the contents of the previous 1954 Order and subsequent amendments, and bringing the technical provisions up to date. A good deal of administrative material has been eliminated. Regulations will be "laid" which will come into force on the same date as the rest of the Order, namely August 15. These regulations will include the Rules of the Air and Air Traffic Control Regulations, the Air Navigation (General) Regulations and the Air Navigation (Fees) Regulations. Among the modifications which the Order and Regulations will affect are:—

(1) Provisions as to flight time limitations have been extended to cover all aircraft operated by an air transport undertaking whether or not the aircraft is actually engaged in public transport. (Thus an aircraft returning empty from a charter flight will be covered.)

(2) Technical requirements for take-off and landing are also being modified. All aircraft flying for public transport or instructional purposes must now use government or licensed airports.

There are exceptions, e.g., aircraft weighing less than 6,000lb and helicopters on non-scheduled services.

(3) Foreign-owned aircraft may now be registered in the UK under certain conditions. Thus when a British airline bare-hull charters an aircraft from a foreign airline, the aircraft may be UK-registered during the time it is in the possession of the British line.

SUPPORT FOR "QUEEN VICTORIA"

TAXPAYERS are unlikely to be told why they should provide almost £20 million for a "Queen Mary replacement," or whether—in view of booming North Atlantic air traffic (see page 879)—it appears to be justified. The Chandos Report, a summary of which has recently been published in *Hansard*, recommends that Cunard set up a subsidiary company to construct and operate such a vessel, the company putting up two-fifths of the capital in the form of shares, and the Government providing the remaining three-fifths in the form of long-term loans.

Unfortunately the summary contains the main recommendations only, no supporting evidence of any kind being given. The reason given for keeping the report proper under shrouds is that evidence was given on the understanding that the report would be confidential. Needless to say, most Select Committees find themselves in the same delicate position, but they manage to get around the problem by the insertion at appropriate places of * * * *. Perhaps a little Parliamentary pressure might yet lead to the appearance of an expurgated version.

In a revealing introduction, the summary discloses that the committee was not asked to investigate whether an express sea service should be maintained and if so on what terms, but was merely invited "to consider how . . . the service could best be maintained." In order to forecast the future traffic trends and to understand the demands of sea travellers, the committee enlisted the specialist support of *The Economist* Intelligence Unit and Research Services Ltd; useful as these reports would be to the travel business, both are apparently considered to be of too confidential a nature for even their broad findings to be revealed.

Having completed their deliberations, the committee comes out in support of Cunard's large, fast, prestige liner. This vessel would weigh 75,000 gross tons, would travel at 29½kt, would be 990ft long and 114ft wide, and would accommodate 2,270 passengers. Cost would be £25-£30 million.

As Cunard can only contribute £12 million towards this sum, the remaining £18 million would come from Government loans at interest rates varying from 2½ to 4½ per cent. These loans would be redeemed after 25 years, by which time the liner would be fully depreciated. If the gross yield on Cunard's investment exceeded 7 per cent, then the excess would be employed to accelerate redemption of the Government loan. Conversely, should this yield fall below 3 per cent, then the interest rate would be reduced.

The recent Bow Group publication, *Wings Over Westminster*, showed that the financial charges per passenger were four times more for a hypothetical "Queen Victoria" than for a Boeing 707 (£42 *v* £10). Those figures were based on a depreciation period for the ocean liner of 12½ years. Even taking the remarkably long depreciation period of 25 years, the ocean liner will involve capital charges of about £30 per passenger, i.e. three times more than the jet. This amount looks so absurd when set against fares that will range between £50 and £100 that one wonders whether Cunard in their own interests would be advised to put their shareholders' money into Eagle Airways instead.

BREVITIES

It is reported that Alitalia are to place a repeat order for two Conway-powered DC-8s. The number on order at the moment is six.

Qantas plans to start a weekly all-freight service between Sydney and Hong Kong next month, linking with BOAC's all-freight services from London. Later Qantas hopes to extend its own service to London.

August 18 is the date announced by East African Airways for the introduction of their Comet 4s, the first of their order for two being due for delivery soon. On August 18 EAA will inaugurate Comet 4 services from London to Dar-es-Salaam via Rome, Khartoum, Entebbe and Nairobi.

Harold Bamberg, chairman of Eagle Aviation, has been elected to the boards of Cunard Steamship and Cunard White Star. This follows Cunard's acquisition of a controlling interest in the Eagle group of companies last March. Mr Bamberg is also chairman of Sir Henry Lunn, the travel agents.

Talks between the USA and USSR to negotiate a bilateral air agreement have advanced from the date, July 18, previously considered. The Russians accepted an American invitation to start talks in the USA on June 18. The Russian delegation is headed by General E. Loginov, chief of Aeroflot.

Australia has successfully negotiated a $30m loan to help finance the completion of Qantas' Boeing 707 programme. The Ex-Im Bank of Washington is to lend Qantas $25.5m, with Boeing lending the balance. Qantas, as previously recorded, are to add three 707s (P & W JT3D turbofans) to their present fleet of seven, which will be retrospectively re-engined with turbofans.

It is with regret that we announce the death of J. M. Twiss, one of the general managers of Skyways. He had been associated with Eric Rylands for 26 years, and he died on June 12 after a short illness following a major operation. He leaves a widow and a son and daughter. He played a prominent part in the group of companies directed by Mr Rylands and, say Skyways, "his loss will be greatly felt."

On June 17 Kuwait became the 78th member state of ICAO.

It is reported that the Universal Postal Union Congress in 1962 is to reduce mail rates below the present 192 cents per ton mile.

Folkestone will be the venue for this year's two-day conference of the Aerodrome Owners Association. The dates are October 11 and 12, and conference headquarters will be at the Grand Hotel.

The Britannia 305 (G-ANCH) which was sold by Bristol Aircraft to Ghana Airways is now designated Britannia 309. Two DC-3s, both ex-Field Aircraft Services, have been delivered to Ghana Airways also.

A. W. Robertson, Aerolineas Argentinas' general representative in the UK, is to take up a new appointment in Buenos Aires. He is succeeded by Paul Hildebrandt, formerly the company's representative in Western Germany.

A Constellation owned by Pacific Northern Airlines was lost on June 14 on a flight between Cordova and Anchorage. It is reported that there were 60 passengers on board when the aircraft left Seattle, of which 52 disembarked at Cordova.

Having already applied to operate "no-reservation" services on the New York - Washington route, Allegheny Airlines now plan to offer such a reduced-fare amenity on their Boston - Providence - Philadelphia services. Already Allegheny operate Convair 540s (Napier Eland) on the Pittsburgh - Philadelphia route (*Flight*, May 27).

Silver City have applied to operate a car ferry service between Blackpool and the Isle of Man. Also announced are Dan-Air's plans to operate UK internal services between Plymouth and Bristol, and Liverpool - Newcastle. Dan-Air also applied to operate a seasonal service between London (Gatwick) and Jersey.

"Flight" photograph

Two former corporation front-line types now earning money for the independents are Air Safaris' one Hermes 4, G-ALDM, and one of Dan-Air's three Ambassadors, seen together at Gatwick last week. Of the 25 ex-BOAC Hermes 4s, 15 are now distributed as follows: Air Safaris, 1; Bahamas Airways, 2; Silver City, 4; Falcon Airways, 2; Skyways, 6. Of the 20 DH-Airspeed Ambassadors originally delivered to BEA, 18 are now distributed as follows: BEA, 9 (to be sold); BKS, 3; Dan-Air, 3; Rolls-Royce, 1 (Tyne test-bed); Shell Aircraft, 2

SERVICE AVIATION

Air Force, Naval and Army Flying News

Gloster Javelin FAW.2s of No 46 Sqn, based at Waterbeach, in formation for the camera of Russell Adams. They are led by the CO, Wg Cdr F. B. Sowrey

Admiralty Says No

THERE will be no Fleet Air Arm flying display at this year's SBAC Show. A statement by the Admiralty last week said that it had "reluctantly declined" an invitation for its aircraft to take part.

Explaining this decision (a disappointing one for the public, in view of the fine shows put on by the Scimitars and Sea Hawks in past years), the Admiralty says that this year "there is a very much more intensive programme of introducing new aircraft into our carriers, and the lengthy training and preparation required to take part at Farnborough could not have been undertaken without serious prejudice to the operational efficiency of the Fleet."

Meeting Cpl Sparkes

ON the afternoon of June 10 (writes "J.C.C.") some eighty ex-boy mechanics of the first and second entries at Cranwell—February and September, 1920—foregathered at Halton, by kind permission of the Commandant (Air Cdre T. N. Coslett) for a reunion to mark the fortieth anniversary of the Aircraft Apprentice Training Scheme.

Highlights of a conducted tour of the Apprentice Wing were the reminiscences evoked when a part-sectioned Monosoupape engine was encountered in the engine instruction shop—one enthusiast even claiming to recognize the serial number—and meeting a civilian instructor in the airframe shop. As the ex-apprentices crowded round to shake his hand, they addressed him as "Cpl Sparkes"—as they had last done when he instructed them in the art of rigging an Avro 504K.

By special request, tea was taken in one of the Boys' Messes, after which the visitors adjourned to the Officers' Mess at Halton House—where an exhibition of photographs, records and Boys' Wing magazines stimulated further reminiscences. The summons to dinner by a fanfare played by six boy trumpeters was acclaimed by several ex-members of the Boys' Wing Band. Just over a hundred sat down, under the presidency of Air Cdre H. E. Nowell, the senior ex-boy present.

In addition to the Commandant of Halton, guests included the following members of the original staff of the Boys' Wing at Cranwell: Air Chief Marshal Sir Leslie N. Hollinghurst, Air Cdre P. Huskinson, Gp Capt R. J. F. Barton, Wg Cdr A. E. F. McCreary, Wg Cdr R. C. Preston and T. Harriman. Air Chief Marshal Sir Walter L. Dawson was present as one of the first boy entrants into the RFC.

Air Chief Marshal Sir Leslie Hollinghurst, one of the after-dinner speakers, recalled that as Deputy Director of Operations in 1939 he appreciated to the full the value to the RAF at that critical time of Lord Trenchard's far-sighted policy.

What a pity Trenchard could not have been present on this day. He would have been proud to see the old boys along with the new and to hear the former generally proclaiming that, if faced with the decision of choosing a career, they could ask for nothing more than the privilege of serving him again.

Heralds for RAAF?

DURING his visit to Europe as head of an RAAF purchasing mission the Australian Chief of Air Staff, Air Marshal Sir Frederick Scherger, flew from Villacoublay to Gatwick on June 16 in the Handley Page Dart Herald. The aircraft then took the RAAF party (which is primarily inspecting fighter aircraft) to the headquarters of Transport Command at Upavon, where they met the AOC-in-C, Air Marshal Sir Denis Barnett. Handley Page Ltd have stated that the RAAF is interested in the Herald as possible new equipment for its own Transport Command. (Relative suitability of the Herald and the Fokker Friendship for this purpose have been the subject of recent letters, from their respective manufacturers, in our correspondence columns.)

Photogenic Tie

A TIE has been designed for the RAF School of Photography, its design a repeated motif of the school's gold crest on a dark blue background. It may be worn by all members of trade group 14 who have passed through the school, permanent staff of three months' standing, and trainees. The tie costs 12s (12s 6d by post) and may be obtained from the Adjutant, School of Photography, Royal Air Force, Wellesbourne Mountford, Warwicks. Cheques or POs should be made payable to "School of Photography Tie Fund" and crossed.

IN BRIEF

Air Cdre A. G. Dudgeon has been appointed AOC Air Cadets and Commandant of the ATC.

Command of the Royal Malayan Air Force has recently been taken over by Gp Capt J. N. Stacey.

Gp Capt J. M. N. Pike, SASO at AHQ Malta since November 1957, is to be AOC Gibraltar with the acting rank of air commodore.

Air Cmdt Anne Stephen is making her first overseas visit since being appointed Director of the WRAF, on a tour of British Forces Arabian Peninsula and FEAF units.

Three awards have been announced to RAF men for distinguished service in Malaya, Sqn Ldr S. R. Dixon receiving the DFC, F/Sgt P. J. E. Payne the DFM and Acting Sgt A. J. McHugh the BEM.

No 98 Sqn is holding its first annual reunion at the Paviour's Arms, Page Street, Westminster, London SW1, on Friday, July 15, at 1900hr. Ex-members wishing to attend should contact the Adjutant, No 98 Squadron, RAF Driffield, Yorks.

F/Sgt Basil Breach of No 228 Sqn, Coastal Command, has been awarded the Alan Marsh Prize by the rotorcraft section of the RAeS for his "brilliantly skilful performance" in rescuing five of the crew of the North Carr lightship in a Sycamore helicopter last December.

At the 11th annual championships of the RAF Model Aircraft Association, at RAF Debden on July 2 and 3, a new trophy—for the station whose members achieve the most points—is being presented by Mrs. Grahame-White in memory of Claude Grahame-White.

The Bomber Command Vulcan which was extensively damaged in an accident during a display at the opening last October of Wellington Airport, New Zealand, was test-flown on June 17 at RNZAF Ohakea—where it has been under repair—by a crew from No 617 Sqn.

Fg Off J. B. Griffith won the Cup of Honour, DH Flying Trophy and the Aerobatic Trophy for No 144 Provost/Vampire Course at No 3 FTS, Oakington. The Ground School Cup was won by Plt Off D. C. Brown. At the passing-out parade on June 15 the reviewing officer was Air Cdre W. T. Coles, SASO at No 3 Group, Bomber Command.

South American study: An Avro Vulcan of No 101 Sqn (Wg Cdr W. J. H. Roberts) at Recife, Brazil, during the recent 18,000-mile goodwill tour by the RAF of five South American capitals

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